



Hunt Institute for Botanical Documentation  
5th Floor, Hunt Library  
Carnegie Mellon University  
4909 Frew Street  
Pittsburgh, PA 15213-3890  
Telephone: 412-268-2434  
Email: [huntinst@andrew.cmu.edu](mailto:huntinst@andrew.cmu.edu)  
Web site: [www.huntbotanical.org](http://www.huntbotanical.org)

The Hunt Institute is committed to making its collections accessible for research. We are pleased to offer this digitized item.

#### *Usage guidelines*

We have provided this low-resolution, digitized version for research purposes. To inquire about publishing any images from this item, please contact the Institute.

#### *Statement on harmful and offensive content*

The Hunt Institute Archives contains hundreds of thousands of pages of historical content, writing and images, created by thousands of individuals connected to the botanical sciences. Due to the wide range of time and social context in which these materials were created, some of the collections contain material that reflect outdated, biased, offensive and possibly violent views, opinions and actions. The Hunt Institute for Botanical Documentation does not endorse the views expressed in these materials, which are inconsistent with our dedication to creating an inclusive, accessible and anti-discriminatory research environment. Archival records are historical documents, and the Hunt Institute keeps such records unaltered to maintain their integrity and to foster accountability for the actions and views of the collections' creators.

Many of the historical collections in the Hunt Institute Archives contain personal correspondence, notes, recollections and opinions, which may contain language, ideas or stereotypes that are offensive or harmful to others. These collections are maintained as records of the individuals involved and do not reflect the views or values of the Hunt Institute for Botanical Documentation or those of Carnegie Mellon University.

#### *About the Institute*

The Hunt Institute for Botanical Documentation, a research division of Carnegie Mellon University, specializes in the history of botany and all aspects of plant science and serves the international scientific community through research and documentation. To this end, the Institute acquires and maintains authoritative collections of books, plant images, manuscripts, portraits and data files, and provides publications and other modes of information service. The Institute meets the reference needs of botanists, biologists, historians, conservationists, librarians, bibliographers and the public at large, especially those concerned with any aspect of the North American flora.

Hunt Institute was dedicated in 1961 as the Rachel McMasters Miller Hunt Botanical Library, an international center for bibliographical research and service in the interests of botany and horticulture, as well as a center for the study of all aspects of the history of the plant sciences. By 1971 the Library's activities had so diversified that the name was changed to Hunt Institute for Botanical Documentation. Growth in collections and research projects led to the establishment of four programmatic departments: Archives, Art, Bibliography and the Library.

## COTTON HYBRIDS AT RIVERSIDE, CALIF. 1936.

F <sub>1</sub> Hybrids (W numbers)	:	CB and W numbers of parents.
#1 (barbadense x Schottii) x anomalum	:	W 46 x 1051
#3 herbaceum x cernuum	:	743 x W 15 (W 15 seems good <u>cernuum</u> )
#8 Armourianum (spotless) x Thurberi	:	867 x 112 (both parents <u>spotless</u> )
#9 Armourianum x Thurberi	:	867 x 112 (Thurberi parent <u>spotted</u> )
#10 Davidsonii x Klotzschianum	:	101 x 700
#21 hirsutum x cernuum	:	W 64 x W 15 (W 64 Red Acala)
#25 hirsutum x barbadense(?) Br. Mohauv:	:	723 x 204a
#26 contextum x Hopi	:	542 x 716
#27 sanguineum x anomalum	:	787 x 1051
#28 barbadense x tomentosum	:	W 23 x 527 (W 23 Pima, 20th gen. inbred)
#29 hirsutum x tomentosum	:	723 x 527 (723 <u>hirsutum</u> from Rhodesia)
#33 barbadense x Sturtii	:	W 5 x 564 (W 5 <u>barbadense</u> , 1 gen. inbred) <u>1/</u>
#34 hirsutum x Armourianum	:	W 24 x 867 (W 24 Acala, 9 gen. inbred)
#35 Sturtii x Harknessii	:	564 x 861 (564 = 632)
#36 barbadense x Harknessii	:	W 5 x 861 (W 5 <u>barbadense</u> , 1 gen. inbred)
#37 hirsutum x Thurberi	:	W 24 x 112 (W 24 Acala, 9 gen. inbred)
#38 barbadense x Harknessii	:	W 23 x 861 (W 23 Pima)
#39 Sturtii x Harknessii	:	564 x 861
#40 Sturtii x Armourianum	:	564 x 867
#41 Harknessii x Armourianum	:	861 x 867
#43 hirsutum x Armourianum	:	W 24 x 867 (W 24 Acala, 9 gen. inbred)
#44 hirsutum x Thurberi	:	W 12 x 112 (W 12 Rowden Lintless, 1 gen. inbred)
#45 sanguineum x africanum	:	787 x 419
#46 barbadense x Schottii	:	W 23 x 672 (W 23 Pima)
#47 hirsutum x punctatum	:	(not in field in 1936)
#48 herbaceum x neglectum	:	743 x 785
#49 barbadense x Schottii	:	W 23 x 672 (W 23 Pima)
#50 hirsutum x barbadense	:	723 x W 23 (723 <u>hirsutum</u> , Rhodesia, W23 Pima)
#51 contextum x Schottii	:	542 x 672
#52 Sturtii x Harknessii	:	564 x 861 (564 = 632)
#53 barbadense x punctatum	:	(not in field in 1936)
#54 ditto	:	W 23 x 437 (W 23 Pima)
#55 (contextum x Hopi) x anomalum	:	W 26 x 1051
#56 contextum x Armourianum	:	542 x 867
#57 barbadense x Sturtii	:	W 5 x 632 (W 5 <u>barbadense</u> (Sea Island?))
#58 <del>thespesioides</del> x Sturtii <i>Thurberi</i>	:	112 x 632
#59 Davidsonii x Sturtii	:	101 x 632
#79 Nanking x Thurberi	:	824 x 112
#80 hirsutum (Red) x tomentosum	:	W 64 x 527 (W 64 Red Acala)
#81 hirsutum (Red) x Sturtii	:	W 64 x 632 (W 64 " " )
#82 hirsutum x Sturtii	:	723 x 632 (723 <u>hirsutum</u> from Rhodesia)
#95 purpurascens x tomentosum	:	531 x 527 (531 = 671)
#99 sanguineum x Stocksii	:	787 x 763
#101 Armourianum x ? (mutant?)	:	867 x ?
#111 herbaceum x Sturtii	:	743 x 632
#139 hirsutum x Sturtii	:	W 24 x 632 (W 24 Acala, 9 gen. inbred)

1/ The W 5 parent looks like Sea Island cotton, seeds nearly naked.

Characters	: Armourium	: Thurberi	: F <sub>1</sub>
Twigs, <i>shape of cross-section</i>	: terete	: quadrangular	: rounded-quadrangular
Bark of twigs	: reddish	: reddish brown or tinged therewith.	: tinged with reddish brown.
" older	: light reddish brown	: light brownish gray	: brownish gray
Petioles	: terete	: quadrangular	: terete or nearly
Petioles (rel. to blades)	: as long or slightly longer	: somewhat shorter	: mostly shorter
Leaf blades	: thick	: thin	: thick
" "	: shiny both faces	: not shiny	: shiny above
" " pubescence	: soon glabrous	: ciliolate, puberulent on veins	: glabrous
" " margins	: not, or very obscurely whitish	: rather conspicuously whitish	: whitish-margined
" " lobation	: entire	: pedately 3-5-parted	: deeply 3- to 5-lobed
" " apex	: obtuse or acutish, often mucronate	: attenuate-acuminate	: acuminate but obtuse and often mucronulate
" " length	: up to 3.5 cm.	: up to 15 cm.	: 6.5 to 7 cm.
" " basal sinus	: open, broadly 3-angular	: very open, triangular, narrow at base	: very narrow at base, open, triangular above
" " nectary	: triangular, barely 1 mm. long	: 1 to 4 mm. long, triangular or elliptic	: rounded deltoid, about 1 mm. long
" " <i>midlobe base</i>	: <i>not crenate</i>	: <i>crenate</i>	: <i>crenate</i>
Peduncle, nectaries	: none	: 2 or 3, often large	: large, at base of 2 or all 3 bractlets
Involucl	: caducous long before anthesis	: persistent to maturity, spreading	: deciduous long before anthesis, slightly spreading
" bractlets	: 2 to 5 mm. long	: 7 to 15 mm. long	: about 7 mm. long
Calyx, length at anthesis	: 5 to 10 mm.	: ± 4 mm.	: 5 to 6 mm.
" margin	: 5-dentate with 3 angular or subangular late teeth	: usually merely undulate	: abruptly 5-dentate, teeth deltoid, acute
Petals, color	: pale green-yellow	: white	: ochroleucous
" spots	: none or present	: none or present	: spotless in W8, faintly spotted (sometimes) in W9
Anthers, connective	: carmine, or dark purple	: dull orange	: reddish brown
Pollen	: nearly apricot-yellow	: white or cream	: on different plants either cream, or pale orange

Characters	: Armourianum	: Thurberi	: F <sub>1</sub>
Pistil, length above ovary	: 20 to 25 mm.	: 18 mm.	: 25 mm.
Pistil color	: white	: pale green	: white on one plant, pale green on another
" " oil-glands	: red-brown, or nearly black	: deeper green	: reddish brown
Ovules per locule	: ± 3	: usually 6	: 3

Column length	7-8 mm.	± 13 mm.	12 mm.
n proportion anthers	1/2	nearly 2/3	1/2
Filaments (lower) length	1 mm.	3 to 4 mm.	3 mm.
Pistil, proportion exerted	1/2	1/3	very nearly 1/2

Characters added in ink on this & succeeding sheets were determined at Riverside in late August & September, 1938. The flowers of G. Armourianum at Riverside were very small in September, 1938.

Characters	: barbadense	: Harknessii	: F <sub>1</sub>
Stipules	: persistent until leaf : nearly full grown	: caducous	: as in barbadense : less persistent on : one plant
" length and shape	: 10 to 20 mm., lanceo- : late	: 5 to 6 mm., subu- : late	: 12 to 18 mm., nar- : rowly lanceolate
Petioles	: very stout	: slender	: rather stout
" relative length	: mostly about as long : as blade	: about as long as : blade	: about as long as : blade
Leaf-blades, color	: dark green	: yellowish green	: deep bluish green
" " , lobation	: deeply 5-lobed	: shallowly 3-lobed	: rather deeply 3 : (majority) to : 5-lobed
" " , apex	: acuminate and (often : long-) mucronate	: short-acuminate, or : acutish and mu- : cronate	: long-acuminate, : mostly mucronate
" " , length	: up to 20 cm.	: up to 6 cm.	: up to 16 cm.
" " , midlobe	: oblong-ovate	: broadly deltoid	: ovate
" " , basal sinus	: deep, open 3-angular : below, narrow or : closed above	: deep, open triangu- : lar, or closed : above	: deep, open <del>to</del> tri- : angular below, : narrow or closed : much of length
" " , pulvinus	: greenish or brownish, : large	: greenish or brown, : very small	: dull brown or : reddish, small
" " , nectary	: 2 to 5 mm. long, often : on 3 veins	: less than 1 mm. : long, near base : midvein	: 1 to 2 mm. long, : usually on all 3 : veins
" " " , shape	: triangular or nearly : circular, often : irregular	: round, 3-angular, : or slit-like	: rounded-triangular ✓
Peduncle, nectaries	: large, but apparently : often non-functional	: none	: 3, large, nearly : circular or inverted : delta-shaped

Characters	: barbádense	: Harknessii	: F <sub>1</sub>
Involucel	: persistent to maturity	: persistent usually	: persistent after
	:	: until anthesis	: anthesis
	:	:	:
" , bractlets	: separate or slightly	: separate	: separate
	: connate	:	:
	:	:	:
" " , shape	: broadly ovate	: narrowly-ovate, or	: broadly deltoid-ovate
	:	: oblong-ovate	:
	:	:	:
" " , base	: deeply cordate	: truncate or nearly	: moderately cordate
	:	:	:
" " , dentation	: lacinate on 2/3 of	: denticulate or few-	: lacinate on most of
	: margin with 3-angular	: dentate near apex	: margin with lanceo-
	: setaceous teeth	:	: late-setaceous teeth
	:	:	:
" " , length	: 35 to 45 mm.	: 10 to 25 mm. long	: $\pm$ 45 mm.
	:	:	:
Calyx, length (anthesis)	: about 8 mm.	: 6 to 8 mm.	: 8 to 10 mm.
	:	:	:
" oil glands	: many, very small,	: few, inconspicuous,	: very numerous, very
	: black	: greenish	: small, black
	:	:	:
" margin	: shallowly and very	: undulate or denticu-	: merely undulate
	: broadly crenulate	: late	:
	:	:	:
Petals, color	: yellow	: light green-yellow	: between Marti <sup>u</sup> s and
	:	:	: picric yellow or
	:	:	: pale green yellow
	:	:	: (about 2 grades
	:	:	: lighter than
	:	:	: barbádense).
	:	:	:
" , length	: 6 cm.	: 3 to 5 cm.	: 5 to 6 cm.
	:	:	:
" spots	: large, striate at	: none	: large, grade 6 to 7
	: Riverside (grade 6 $\frac{1}{2}$ )	:	:
	:	:	:
Ovules per locule	: about 8	: 3 or 4	: $\pm$ 6

Characters	: barbadense (W5)	: punctatum	: F <sub>1</sub>
Fruiting branches	: ascending-spreading	: spreading-drooping	: ascending-spreading, : mostly transformed : into limbs
Twigs and petioles	: glabrate	: sparsely villous : with long, lax hairs	: very sparsely villous : when very young
Leaf-blades, pubescence	: glabrous, or very : sparsely villous on : veins beneath when : young	: similarly pubescent : on margins and veins : beneath	: very sparsely villous : on margins and : veins beneath when : young, then : glabrate
" " , lobation	: deeply 5-lobed	: very shallowly : 5-lobed	: rather deeply 5-lobed : (intermediate)
" " , lobes	: oblong-ovate (midlobe) : acuminate & mucronate	: deltoid, more or less : acuminate, often	: deltoid-ovate : (intermediate) : long-acuminate, not : toothed
" " basal lobes	: well-developed on : larger leaves	: often reduced to : coarse teeth	: well-developed
" " basal sinus	: often narrow or closed : above, open 3-angular : below	: rather deep and : narrow	: deep, wide or narrow, : closed near base
Involucel, teeth	: glabrous, or sometimes : sparsely ciliate	: sparsely long- : ciliate	: sparsely long- : ciliate
" bractlets	: lacinate on 2/3 of : margin	: dentate on nearly : the whole margin	: as in punctatum
" " teeth	: 3-angular-lanceolate, : setaceous-acuminate	: lanceolate, : setaceous-acuminate	: much as in barbadense
Calyx, margin	: shallowly and very : broadly crenulate	: 5-dentate, with : rounded to very : acute teeth	: as in barbadense
Petals, color	: bright yellow	: pale yellow	: very pale yellow
" spots	: large, striate at : Riverside, grade 6 $\frac{1}{2}$	: spotless	: spotted, grade 6 $\frac{1}{2}$

Characters	: barbadense (W5)	: punctatum	: F <sub>1</sub>
Filaments	: short, mostly white	: long, pale yellow	: long, white
	:	:	:
Pollen	: bright yellow	: cream-colored	: bright yellow
	:	:	:
Stigmas	: slightly to rather	: slightly exserted	: well-exserted
	: long-exserted	:	:

Characters	: barbadense	: Sturtii	: F <sub>1</sub>
Bark, of twigs	:reddish brown, or : green tinged with red	:pale green or red- : dish brown, glaucous	:reddish brown or green : tinged therewith, : glaucous
Bark older	:light brown	:light purplish gray	:as in Sturtii
Stipules	:persistent until leaf : nearly full-grown	:caducous	:intermediate
" , length	:10 to 20 mm.	:about 7 mm.	:10 to 20 mm.
Petiole	:very stout, mostly : about as long as : blade	:slender, 2/3 as long : as blade	:rather stout, often : not or slightly : equalling or longer : than blade
Leaf-blades, color	:dark green	:bluish green, very : glaucous	:light to dark green, : not or slightly : glaucous
" " lobation	:deeply 5-lobed	:entire	:shallowly and broadly : 3-lobed, or rather : deeply and narrowly : 3- to 5-lobed
" " apex	:acuminate and often : long-mucronate	:acutish, cuspidate	:short- to rather long- : acuminate, cuspidate
" " length	: up to 20 cm.	: up to 8 cm.	: up to 16 cm.
" " basal sinus	:deep, open-triangular : below, narrow or : closed above	:very short & narrow	:shallow, usually open : but narrow above
" " pulvinus	:large, greenish or : brownish	:very small, pinkish : or purplish brown	:small or large, dull : brown or reddish
" " nectary	:large, 2 to 5 mm. long : often on 3 veins	:lanceolate, near : base midvein	:large, lanceolate or : deltoid on midvein : only, or all 3 veins
Involucel	:persistent to maturity	:persistent to : maturity	:persistent until after : anthesis
" bractlets	:nearly separate	: separate	: separate
" " , base	:deeply cordate	: subcordate	: shallowly cordate
	:	:	:

Characters	barbadense	Sturtii	F <sub>1</sub>
Involucrel bractlets, dentation	:laciniate on 2/3 of margin, teeth triangular-lanceolate and setaceous	:entire, or very nearly	: laciniate with few or numerous subulate or narrowly lanceolate, late, setaceous teeth
" " length	: 3.5 to 4.5 cm.	: about 2 cm.	: 3 to 4 cm.
Peduncle, nectaries	:large, but apparently often non-functional, sometimes wanting	: 3, often red	: 1 to 3, small
Calyx, margin	:broadly and very shallowly crenulate	:short-dentate with 3-angular-subulate teeth	:sharply and deeply dentate, with deltoid subulate teeth
" nectaries	:small, transversely elongate (W5) absent (W23, 1065)	: none	:none, or very indefinite
Petals, length	: 6 cm.	: 5 to 6 cm.	: ± 5.5 cm.
" ciliation	:ciliate but not very densely	:densely ciliate near base	:densely ciliate near base
" color	: bright yellow	: pale mauve	:Tyrian pink to rose-color
" spots	:large, striate, grade 6 $\frac{1}{2}$	:long, very asymmetric, deeply feathered	:shorter, broader and more solid than in Sturtii, less deeply feathered
Column, length	: 15 to 22 mm.	: 20 mm.	: 20 to 25 mm.
Filaments & anthers	:Filaments white, anthers whitish or orange	:nearly pansy purple	:purplish or reddish
Pollen	: bright yellow	: cream	:yellow (lighter than in barbadense)
Pistil, length above ovary	: 20 to 30 mm.	: 22 mm.	: 30 to 35 mm.

Characters	: barbadense	: tomentosum	: F <sub>1</sub>
Twigs, petioles, leaf-blades, involucels	: glabrate, or very sparsely villous (leaves only beneath)	: densely whitish tomentose	: grayish tomentose, much more sparsely so in age than in tomentosum
Bark of twigs	: reddish brown or tinged therewith	: green	: green, tinged with reddish brown
Leaf-blades	: dark green	: bluish, then grayish	: rather deep grayish green
" " lobes	: oblong-ovate (midlobe) acuminate	: ovate or oblong-ovate short-acuminate	: oblong ovate, rather short-acuminate
" " nectaries	: large, 2 to 5 mm. long; often on 3 veins	: none	: small and indistinct, on midvein only or one or both laterals, sometimes none
Involucel, bractlets	: separate or nearly	: connate only very near base	: separate, or very nearly so
" "	: lacinate on 2/3 of margin	: shallowly dentate on margin	: rather shallowly dentate on nearly whole margin
" " teeth	: 3 angular below, setaceous-acuminate	: short, deltoid-subulate	: numerous, lance-subulate, setaceous-tipped, broad below
" " length:	35 to 45 mm.	25 to 30 mm.	45 mm.
" external nectaries	: large, but apparently often non-functional	: none	: usually 3, hairy, non-functional?
Calyx, length	: about 8 mm.	: 4 to 5 mm.	: 6 mm.
" nectaries	: small, transversely elongate, or none	: none	: present, hairy, non-functional?
Corolla, shape	: funnelliform	: very open-campanulate late	: open-campanulate
" length	: 6 cm.	: 3.5 cm.	: 5 cm.
Petals, color (fresh)	: bright yellow	: brilliant lemon-yellow	: deeper yellow than in barbadense
" , " (fading)	: copper-colored	: changing color only slightly	: copper-colored

Characters	: barbadense	: tomentosum	: F <sub>1</sub>
Petals	: not glossy, slightly ruffled	: glossy, ruffled	: scarcely glossy, slightly ruffled
" , spots	: large, striate, grade 6 $\frac{1}{2}$	: none	: grade 6 or 7
Filaments	: short, mostly white	: long and slender, yellowish	: long and slender, nearly white
Pollen, color	: bright yellow	: cream, then pale yellow	: orange-yellow
Pistil	: rather stout	: very slender	: intermediate
" , exertion	: slightly to rather long-exserted	: long-exserted, exserted portion often = column	: long-exserted, exserted portion about 1/2 as long as column
Stigmas	:	: very short, sometimes separate	long, coherent

Characters	: contextum	: Armourianum	: F <sub>1</sub>
Vegetative & fruiting branches:	well-differentiated	: not well-differentiated	: intricately many branched, fr. branches
		: ted	: short, few-flowered,
			: spreading
Twigs and petioles:	villous	: obscurely puberulent, soon glabrous	: sparsely, very short-stellate-pubescent, soon glabrous
Fruiting branches:	: elongate, several-flowered	: very short, flowers often single and as if terminal	: short but well-differentiated, usually 2- to 6-flowered
Leaf-blades, pubescence:	: sparsely villous on larger veins	: obscurely puberulent, soon glabrous	: like the twigs and petioles
" "	: thin, not shiny	: thick, shiny on both faces, especially above	: thick and firm, somewhat shiny above
" " , lobation:	: deeply 5-lobed	: entire, rounded deltoid	: shallowly 3-lobed
" " , size:	: up to 15 cm. long, 20 cm. wide	: up to 3.5 cm. long, usually wider	: up to 9 cm. long, equally or somewhat wider
" " pulvinus:	: conspicuous, reddish brown	: very small, greenish or brownish	: small, purplish brown
" " basal sinus:	: rather deep, usually open	: open, broadly triangular	: very shallow, narrow at base
" " nectary:	: nearly circular	: deltoid or lanceolate	: very small but well-defined on midvein, near base, deltoid or nearly circular
Peduncle:	: not articulated	: articulated to branchlet	: articulated, soon deciduous
" , external nectaries:	: none, or 1 or 2	: none	: 3, large, deep, conspicuous
Involucl:	: persistent	: fugacious	: persistent until flower falls
" bractlets:	: slightly connate	: separate	: widely separate, about 3 mm. apart at base

Characters	: contextum	: Armourianum	: F <sub>1</sub>
Involucrel, bractlets:	5 to 7 long, broad	:	: few, narrowly lanceo-
dentation:	teeth	: entire	: late, setose-tipped
:	:	:	: teeth, as long as
:	:	:	: height of undivided
:	:	:	: portion
" , bractlets, shape:	broadly ovate, deeply cordate	: subulate or narrowly lanceolate	: oblong, somewhat narrowed at base but not clawed
Calyx, nectaries	: apparently present, but poorly defined & perhaps non-functional	: None	: present, but not well-defined
Corolla, shape	: open-campanulate	: very open-campanulate	: open-campanulate
" , length	: 45 to 60 mm.	: 25 to 45 mm.	: 40 to 45 mm.
Petals, color	: nearly white	: pale green-yellow	: very pale-yellow, (lighter than Martius) yellow fading deep rose.
Petals, spots	: none	: present or absent	: large, rather intense, grade 8 or 9
Pollen, color	: nearly colorless	: apricot yellow	: light cadmium
Pistil, length above ovary	: 25 to 35 mm.	: 20 to 25 mm.	: ± 30 mm.
Pistil, exerted portion	: about 2/3 as long as column	: shorter to longer than column	: equalling, or longer than column
Filaments, color	: white	: whitish or purplish	: lower ones, or some- times all, purple
Anthers, connective	: deep cream	: carmine or dark purple	: reddish

Characters	Davidsonii	anomalum	F <sub>1</sub>
Twigs, petioles & leaf-blades	: densely soft-pubescent : with short, stellate : hairs	: villous with long, spreading hairs, : also short-stellate:	: as in Davidsonii but : hairs somewhat longer
Leaf-blades, color	: light green, at first : yellowish	: light yellowish : green	: yellowish green at : first, then deeper : (grayish) green than : in either parent
Leaf-blades (larger)	: entire or coarsely : 1- to 2-toothed	: deeply 5-lobed with : oblong-ovate, acute : lobes	: deeply 5-lobed with : broadly ovate or : oblong-ovate, short- : acuminate lobes
" " , basal sinus	: almost none, blades usually truncate at : base	: deep and narrow, but : open	: rather shallow, open- : triangular, or : almost none
" " , pulvinus	: reddish brown	: greenish	: greenish or reddish : brown
" " , nectaries	: on midvein near base	: well above base on : 3-principal veins	: small but conspicuous, : deltoid or elliptic : about 15 mm. above : base of midvein and : often on 2 laterals
Involucel, bractlets, shape	: oblong-ovate to : broadly ovate	: narrowly lanceolate	: oblong ovate, somewhat : narrowed at base, : somewhat spreading
" " length:	25 to 35 mm.	: up to 15 mm.	: 30 to 35 mm.
" " margin:	: lacinate with 8 to : 10 lanceolate- : setaceous teeth	: almost entire, or : shallowly 3-toothed : near apex	: deeply lacinate (more : than 1/2-way) with 5 : or more lanceolate- : setaceous teeth
" external nectaries:	: small, inconspicuous	: large, rectangular	: small, but well-defined, : transversely rectangu- : lar to nearly circular
Calyx margin	: entire or undulate	: deeply cleft, with : long, deltoid- : subulate teeth	: rather deeply dentate : teeth as in anomalum, : or very broad, shallow, : rounded
Calyx surface	: many-ribbed, the ribs : short, somewhat : prominent	: strongly many-ribbed	: ribbed as in anomalum : but ribs somewhat less : prominent
Petals	: pale greenish yellow	: lavender pink	: cream-colored, with : purplish tinge : externally

Characters	Davidsonii	anomalum	F <sub>1</sub>
Pollen	pale yellow	cream	cream
Pistil, color	: pale green, dotted with: : darker green oil- : glands	:	: white, with dark-brown : (nearly black) oil- : glands
Petal spots	: conspicuous, usually : solid, 5 to 7 mm. long: :	: broad, about 12 mm: : long, intense, : feathered on : margin	: very large, intense, : Sturtii-like, 13 to : 15 mm. long :
Column length	10 mm. to 12 mm.	11 to 14 mm.	13-14 mm.
" proportion anthers to filaments	$\pm \frac{1}{2}$	nearly to base	$\pm \frac{3}{5}$
Filaments (lower) length	<del>2</del> to 3 mm.	1.5 to 2 mm.	1.5 mm.
" color	pale yellow	white	white or faintly purple-tinged
Anther color	cream or pale orange	cream	pale yellow
" connective	not colored	not colored	not colored
Pollen, color	pale yellow	cream	almost none (pale yellow?)
Pistil, length above ovary	15-20 mm.	17-20 mm.	19-21 mm.
" proportion exerted	$-\frac{1}{2}$	$\frac{1}{3}$ to $\frac{2}{5}$	about $\frac{1}{5}$
Stigmas	erect, closely adnate	erect, closely adnate	usually bent, closely coherent
" color	greenish white	white	white
" oil glands	pale green	very dark, purple (very few, near base only)	nearly black, (numerous)

↓ appearing very pale yellow in macerated unopen-  
anthers, but color not dependable.

Characters	Davidsonii	Sturtii	F <sub>1</sub>
Twigs, petioles, leaf-blades, etc.	: densely soft pubescent with short stellate hairs	: glabrous	: glabrous except obscurely puberulent on petiole, pulvinus and bases of leaf veins
Twigs & leaf-blades	: not glaucous	: glaucous	: glaucous, but much less than in Sturtii
Leaf-blades, texture	: soft and rather thin	: thickish, firm	: much as in Sturtii
" " color	: yellowish green, not glaucous	: bluish, very glaucous	: bluish green, slightly glaucous
" " "	: inconspicuously and not prominently punctate	: black-punctate	: punctate as in Sturtii
" " margin	: entire or 1-2-toothed	: entire	: entire, or rarely with a short tooth
" " length	: 5 to 12 cm.	: up to 8 cm.	: up to 8 cm.
" " apex	: short- to long-acuminate	: acutish, cuspidate	: short-acuminate and short cuspidate
" " basal sinus	: open or none	: very short and narrow	: as in Sturtii
" " pulvinus	: reddish brown	: pinkish	: very small, dull brown
Involucel, bractlets, length:	: 25 to 35 mm.	: 20 mm.	: about 25 mm.
" " margin:	: deeply lacinate with 8 to 10 lanceolate-lanceolate teeth	: entire or <sup>very</sup> nearly so	: dentate with few, short deltoid-lanceolate, setose-tipped teeth
Calyx, length	: 4 to 6 mm.	: 6 mm.	: 5 to 6 mm.
" margin	: entire or undulate	: dentate with <del>8</del> 3 angular-subulate teeth	: dentate, with deltoid, acute or setose-acuminate teeth
Petals, length	: 3 to 4.5 cm.	: 5 to 6 cm.	: 3.5 to 4 cm.
" , color	: pale greenish yellow	: pale mauve	: pale rhodonite-pink
" spots, length	: 5 to 7 mm.	: about 15 mm.	: ± 16 mm.
" " "	: not (?) strongly rotate, usually solid	: strongly rotate, deeply feathered	: as in Sturtii
Column, length	: 12 mm.	: 20 mm.	: 16 to 18 mm.

Characters	: Davidsonii	: Sturtii	: F <sub>1</sub>
Column	: stamiferous on : upper half	: stamiferous nearly : to base	: as in Sturtii :
Filaments, length	: 2 to 3 mm.	: 1.5 to 2 mm.	: about 2 mm.
" , color	: pale yellow	: pansy-purple	: deep pink
Anthers, color	: cream	: " "	: cream, bordered with : pink
Pollen, "	: pale yellow	: cream	: very pale yellow
Pistil, "	: pale green, with : deeper green oil- : glands*	: white, with black : oil-glands	: white, oil-glands : very few, dark brown
Stigmas	: often somewhat separ- : ate and slightly : recurved	: closely coherent, : erect	: as in Sturtii :

\* In 1937, at Palm Springs, white, without conspicuous oil-glands.

Characters	Harknessii	Armourianum	F <sub>1</sub> (W 41)
Twigs, petioles, etc.	: densely puberulent with: : very short, stellate : hairs	: obscurely granular- : puberulent, soon : glabrous	: like Armourianum
Older bark	: brownish-gray	: light reddish brown	: light brown
Stipules, length	: 3 to 6 mm.	: 1.5 to 2.5 mm.	: as in Armourianum
Leaf-blades, color	: yellowish green	: dark green or yel- : lowish green	: light green, some- : times yellowish
" " , surface	: not or but very slight- : ly shiny	: shiny on both faces	: less shiny than in : Armourianum, about : as in Harknessii
" " , length	: 3 to 6 cm.	: 2 to 3.5 cm.	: up to 3.5 cm.
" " , shape	: broadly deltoid	: rounded deltoid	: reniform or broadly : ovate
" " , apex	: short-acuminate, or : acutish and mucronate	: obtuse or acutish : and often mucronate	: obtuse (mostly) or : acutish, not : mucronate
" " , base	: deeply cordate	: subcordate, or very : shallowly cordate	: deeply cordate
" " , lobation	: shallowly 3-lobed	: entire	: nearly entire or very : shallowly 3-lobed : with rounded lobes, : less deeply than in : Harknessii.
Peduncle at anthesis	: subclavate, : 5 to 12 mm. long	: subclavate, : 20 to 40 mm. long	: broadly clavate, : 15 to 20 mm. long
" , nectaries	: none	: none	: 3, large, inverted- : delta-shaped
Involucel	: persistent until or : near anthesis	: deciduous long : before anthesis	: slightly more per- : sistent than in : Armourianum, until : flower bud is ± 8 mm. : long
" , bractlets, : width :	: 7 to 15 mm.	: less than 1 mm.	: 4 to 5 mm.
" " length:	: 10 to 25 mm.	: 2 to 5 mm.	: 10 to 12 mm.
" " shape	: narrowly ovate or : oblong-ovate	: subulate or narrowly : lanceolate	: lanceolate or ovate- : lanceolate, acute
" " margin	: entire, denticulate or : few-dentate towards : apex	: entire	: entire or very shal- : lowly 1- or 2-dentate

Characters	Harknessii	Armourianum	F <sub>1</sub> (W 41)
Calyx, margin	: undulate or denticulate : late	: 5-dentate with : triangular or sub- : undulate teeth	: conspicuously but : shallowly dentate : with broadly deltoid, : acute teeth
" nectaries	: none?	: none	: none definite, but : possibly some nec- : tariferous tissue : at base of calyx
" oil-glands	: rather large, fairly : numerous	: large, numerous	: small, numerous, : brownish
Petal spots	: none	: present or absent	: small but conspicuous, : grade 6 to 8
" length	3 to 3.5 cm.	1.5-2 cm. (2.5-4.5)	2.5-3 cm.
" apex	conspicuously ruffled	slightly cress-crested	conspicuously crinkled
Column length	10 mm.	7-8 mm.	10-12 mm.
" proportion within corolla	± 1/2	1/2	± 1/2
Anther color	pale orange	pale orange	pale orange
" connective	deeper colored but not red	with a continuous red line, whose inner border	as in <u>Armourianum</u>
Pistil length (above ovary)	21 mm.	15 (20-25) mm.	25 mm.
" proportion exserted	1/2	1/2	1/2

↓ Flowers of G. Armourianum very small at Riverside in 1938  
 3 But slightly to considerably paler red.

Characters	Harknessii	Thurberi	F <sub>1</sub>
Twigs and petioles	:terete or nearly so	: quadrangular	:rounded-quadrangular
" pubescence	:densely stellate- : puberulent	: soon glabrous :	:densely, minutely : puberulent
Leaf-blades, texture	: thickish	: thin	:thin but firm
" " color	: yellowish green	: bright green	:light grayish green
" " margins	:obscurely puberulent	: ciliolate	:obscurely puberulent
" " lobation	:shallowly 3-lobed : :	: pedately 3 to 5- : parted :	:3 (occasionally 5- : lobed) much less : deeply than in : Thurberi
" " apex	:short-acuminate, or : acutish and mucronate	: long-acuminate :	:long-acuminate :
" " base	:deeply cordate :	: subcordate or : cordate	:rather deeply cordate :
" " lobes	:broadly deltoid :	: lance-elliptic or : lanceolate	:lanceolate or ovate- : lanceolate
" " length	: 3 to 6 cm.	: up to 15 cm.	: up to 11 cm.
" " nectary	:minute (less than 1 mm. : long) on midvein some : distance from base	: triangular or ellip- : tic, lanceolate, : 1 to 4 mm. long	:deltoid or elliptic : 1 to 1.5 mm. long :
Peduncle	:subclavate, 5 to 12 mm. : long :	:clavate at apex, 10 : to 20 (sometimes : 30) mm. long	:strongly clavate at : apex, 20 to 40 mm. : long
"	:angular and furrowed :	: angular and furrowed :	:strongly angled, not : noticeably furrowed
Involucel	:persistent to anthesis, : or nearly : :	: persistent to : maturity : :	:deciduous before : anthesis or per- : sistent until boll : is well-developed
" bractlets, length:	10 to 25 mm.	: 7 to 15 mm.	: 15 to 20 mm.
" " width:	7 to 15 mm.	: 2.5 to 5 mm.	: 8 to 9 mm.
" " margin:	entire to few-dentate :	: entire to denticu- : late	:rather deeply 2 or : 3-toothed
" " shape	:narrowly ovate or : oblong-ovate	: lanceolate	:ovate-lanceolate

Characters	Harknessii	Thurberi	F <sub>1</sub>
Involucel, nectaries	none	2 or 3, often large	3, large and deep
Calyx, length at anthesis	6 to 8 mm.	about 4 mm.	5 to 7 mm.
" oil-glands	few, greenish, inconspicuous	very numerous, small	numerous, very small, yellowish or brown
" margin	undulate or denticulate late	undulate, sometimes few-dentate	undulate, or very short-dentate
" nectaries	none?	none	none, or indefinite
Corolla, shape	very open-campanulate	rather shallowly cup-shaped	cup-shaped, very open and shallow
Petals, length	30 to 50 mm.	25 to 30 mm.	30 to 35 mm.
" color	light green yellow	white	pale yellow
" spot	none	none or faint	none
Anthers, connective	bordered with red or sometimes not	bordered with dull orange	bordered with pale or reddish, brown
Pollen, color	yellow	cream	cream or pale yellow
Pistil, color	white, with pale-brown oil-glands	pale green, with deeper green oil-glands	nearly white, with yellowish oil-glands

Column length	11 - 13 mm.	12 - 15 mm.
u proportion anther from	1/2	1/3 to 1/2
Pistil length (abs. ovary)	20 mm.	27 - 28 mm.
u proportion exserted	± 1/3	3/5 to 1/2

Characters	: herbaceum (743)	: neglectum (785)	: F <sub>1</sub>
Vegetative branches	: ascending-spreading :	: widely ascending : or spreading	: ascending-spreading :
Fruiting branches	: short, spreading :	: rather long, spreading : or slightly : drooping	: rather long, : ascending-spreading :
Twigs and petioles	: puberulent to rather : densely short- : pubescent and sparsely : villous	: sparsely short- : pubescent and : densely villous :	: villous, more so than : in herbaceum, less : than in neglectum, : also short-stellate
Leaf-blades, color	: deep green, tinged : with bronze	: dark grayish green :	: grayish green :
" " lobation	: shallowly 5-lobed	: 5-parted	: deeply 5-lobed
" " lobes	: very broadly ovate, : rounded	: oblong-lanceolate :	: oblong-lanceolate : or ovate-oblong
" " apex	: obtuse, often macro- : nate	: acuminate, often : bluntly so	: short-acuminate, often : bluntly, and mucronate
" "	: more or less cupped : near base	: strongly cupped : near base	: strongly cupped near : base
" " midlobe	: 35 to 45 mm. wide	: 20 mm. wide	: 20 to 35 mm. wide
" " "	: somewhat constricted : at base : :	: not constricted at : base : :	: slightly constricted at : or above base, in : latter case slightly : cleft
" " basal lobes	: sometimes slightly : cleft	: often deeply cleft :	: often cleft, sometimes : deeply
" " (larger)	: 9 cm. long, 11 to : 13 cm. wide	: 9.5 cm. long, : 10.5 cm. wide	: 12 cm. long, 13 cm. : wide
" " nectary	: near base of midvein, : minute (less than : 1 mm.) but conspicu- : ous	: none	: none, or very small, : nearly circular, : near base midvein :
Peduncle, before anthesis	: erect or spreading : or slightly declined	: erect or ascending :	: erect or ascending :
" , in fruit	: usually deflexed :	: often decurved soon : after anthesis	: often decurved :
Involucel, color	: purplish	: green	: purplish
" , bractlets	: strongly connate	: often strongly connate	: connate near base

Characters	: herbaceum (743)	: neglectum (785)	: F <sub>1</sub>
Involucel, bractlets, shape :	broadly deltoid-ovate	deltoid, narrower than in herbaceum	triangular-ovate, intermediate in width
" " margin :	dentate on nearly whole margin, teeth rather long, triangular-setaceous :	teeth subulate, few, very short, mostly 1-2 mm.	teeth few, mostly near apex, up to 4 mm. long, deltoid-setaceous
" "nectaries :	none, or well-developed, but apparently non-functional :	none, or very rudimentary	none, or rudimentary
Calyx margin :	shallowly crenate with very broad, rounded teeth	sharply short-dentate dentate	very short-dentate, teeth deltoid, not setose-tipped
" nectaries :	1 to 3 very large, inverted, delta-shaped, few, rather large, black	none or rudimentary	very large, inverted delta-shaped, sometimes pubescent and apparently non-functional
" oil-glands :	few, rather large, black	rather numerous, large, black	as in neglectum
Corolla, length :	3 to 4 cm.	about 4.5 cm.	about 4 cm.
Petals :	ruffled at apex	slightly ruffled	conspicuously ruffled
" color :	near Martius yellow	pale greenish yellow	between Martius and picric yellow

Characters	herbaceum	Sturtii	F <sub>1</sub>
Twigs and petioles	: puberulent to rather : densely short pubes- : cent and sparsely : villous	: : glabrous : :	: glabrous, or very : nearly : :
Twigs, bark	: green, reddish brown, : finally very dark : brown, not glaucous	: pale green or red- : dish, glaucous :	: green or reddish, : slightly glaucous :
Leaf-blades, pubescence	: pubescent on both : faces	: glabrous :	: soon glabrous :
" " color	: deep green, tinged : with bronze, not : glaucous	: bluish (very : glaucous) :	: slightly glaucous, : deep green, or tinged : with purplish
" " lobation	: shallowly 5-lobed, : midlobe broadly ovate, : rounded	: : entire :	: entire to shallowly : 3-lobed, midlobe broadly : deltoid
" " apex	: obtuse, often : mucronate	: acutish, cuspidate :	: acute or acutish, : cuspidate
" " basal sinus	: shallow, open, broadly : triangular, or narrow : above	: very short and : narrow :	: short and narrow, but : open :
" " pulvinus	: small, reddish brown :	: very small, pinkish :	: very small, light brown : or purplish
" " nectary	: near base of midvein, : minute (less than 1 mm) : but conspicuous.	: elongate, lan- : ceolate :	: near base of midvein : only, very small but : well-defined
Peduncle, before anthesis	: 20 to 30 mm. long, : erect to slightly : declined	: about 12 mm. long, : strongly ascend- : ing	: about 12 mm. long, : ascending :
Involucel, bractlets	: strongly connate :	: separate :	: separate, but approximate : at base
" " , length:	20 to 30 mm.	: +20 mm.	: 15 to 25 mm.
" " margin	: dentate on nearly : whole margin, teeth : rather long, triangu- : lar-setaceous	: entire or very : nearly so :	: rather deeply lacinate : or shallowly dentate, : with several slender : teeth near apex.

Characters	: herbaceum	: Sturtii	: F <sub>1</sub>
Involucel, bractlets, pubescence	: copiously short-stellate-pubescent	: glabrous	: very sparsely puberulent and ciliolate
" bractlets, color	: purplish	: pale green or slightly purplish	: purplish brown
Calyx, oil-glands	: few, rather large, black	: numerous, prominent, black	: rather few, small
" nectaries	: 1 to 3, very large, inverted delta-shaped	: none	: none
Corolla, length	: about 3 cm.	: 5 to 6 cm.	: 4 to 5 cm.
Petals	: ruffled at apex	: not ruffled	: slightly ruffled
" color	: near Martius yellow	: pale mauve	: deep rose-pink
" spots	: solid	: deeply feathered	: broader than in Sturtii but similarly feathered
Pollen, color	: empire yellow	: cream	: pale yellow, or cream (different plants)
Column, length	: <u>+</u> 15 mm.	: 20 mm.	: 20 mm.
Filaments, lower, length	: about 2 mm.	: 1.5 to 2 mm.	: about 3 mm.
" color	: white (sometimes purplish?)	: purple	: purple
Stigmas	: not, to considerably, exerted	: greatly exerted	: short, short-exserted

Characters	: hirsutum (W24)	: Armourianum	: F <sub>1</sub>
Twigs, petioles and veins of lower leaf-surface	: sparsely villous : with rather long, : simple or branched : hairs	: obscurely puberulent, : soon glabrous : :	: stellate-puberulent, : glabrate : :
Bark of twigs	: reddish-brown, not : glaucous	: reddish and more or : less glaucous	: reddish-brown, glaucous : :
Older bark	: light brown	: light reddish brown	: light brown
All parts	: glandular-punctate :(leaf-blades rather : obscurely) with : black oil-glands	: glandular-punctate : with brown oil-glands : :	: glandular-punctate, : with dark oil-glands : :
Stipules	: persistent, 10 to : 15 mm. long	: caducous, 1.5 to : 2.5 mm. long	: rather persistent, 7 : to 10 mm. long
Petioles	: stout, equalling to : much longer than : blades	: slender, equalling or : slightly longer than : blades	: intermediate in size, : equalling or longer than : blades
Leaf-blades, lobation	: rather deeply : 5-lobed	: : entire	: entire or shallowly : 3-lobed with deltoid : lobes
" " , texture	: thickish, rather : firm	: thick and firm	: thick and firm
" " , color	: bright green	: dark or yellowish : green	: rather deep green, : somewhat glaucous
" " , surface	: not shiny	: shiny on both faces :	: shiny only when very : young
" " , base	: deeply cordate, : sinus often narrow	: subcordate, or very : shallowly cordate	: rather deeply cordate, : sinus broad, narrow : at base
" " , apex	: abruptly acuminate :	: obtuse or acutish and : often mucronate	: acute or very short- : acuminate, mucronate
" " , pulvinus	: large, reddish brown :	: very small, greenish : or brownish	: small, reddish brown :
" " length	: up to 10 cm.	: 2 to 3.5 cm.	: up to 8 cm.
Fruiting branches	: long, several- : flowered, spreading : :	: very short, mostly : 1-flowered, peduncle : appearing terminal : and articulated	: short or long, 2 to : 7-flowered, spreading : :

Characters	: hirsutum (W24)	: Armourianum	: F <sub>1</sub>
Involucel	: persistent	: deciduous long before anthesis	: persistent, at least until anthesis
" bractlets	: slightly connate at base	: separate	: separate, widely
" ", length:	: 4.5 to 5 cm.	: 2 to 5 mm.	: 2.5 cm.
" ", shape:	: broadly deltoid-ovate: deeply cordate, deeply laciniate with numerous, long teeth	: subulate or narrowly lanceolate, entire	: deeply laciniate with 3 to 7 long, lance-subulate, setose-tipped teeth
" nectaries	: 2 (or 3 ?) deep, nearly circular	: none	: 3, very deep, inverted delta-shaped or nearly circular
Calyx at anthesis	: 12 mm. long, deeply dentate with broad-deltoid, acute teeth	: 5 to 10 mm. long, dentate, teeth 3-angular or subulate, 1 to 2 mm. long	: 11 mm. long, abruptly dentate with subulate teeth
" oil-glands	: rather numerous, small, black	: numerous	: many, very small, black
" nectaries	: none, or indefinite	: none	: indefinite
Corolla, length	: 4 cm. (not full size)	: 2.5 to 4.5 cm.	: 4 to 4.5 cm.
Petals	: rather densely ciliate near base	: densely ciliate near base	: densely ciliate near base
" , color	: nearly white	: pale green-yellow	: pale green-yellow
" , spot	: none	: none to pronounced	: present, faint or intense, or often none
Anthers, connective	: deep cream	: bordered with red or dark purple	: with or without red border
Pollen, color	: cream	: near apricot yellow	: light cadmium
Stigmas	: scarcely exerted	: very long-exserted	: very long-exserted, <sup>^</sup>
Ovules, per locule	: ± 10	: usually 3	: exerted portion = or longer than column

about 7

Characters	: hirsutum (W 64) <sup>1/</sup> :	cernuum (W 15)	: F <sub>1</sub>
Fruiting branches	: long, ascending- : spreading	: spreading or mostly : drooping	: numerous, nearly hori- : zontal, 4 or 5- : flowered
Bark of twigs	: dark brown-purple	: reddish brown	: dark brown, becoming : nearly black
Twigs and petioles	: copiously long-villous : with branched and : simple hairs	: densely stellate- : puberulent and sparse- : ly villous	: densely villous
Leaf-blades, color	: bronze-purple	: rather dark grayish : green	: dark bronze green, with : reddish brown veins
" " , lobation:	: shallowly 3 to 5-lobed; : when 5-lobed basal : ones mere teeth	: deeply and narrowly : 5-lobed	: deeply 5-lobed
" " pubescence:	: villous on veins	: short-stellate both : faces, villous on : veins beneath	: copiously short- : stellate both faces : and long villous on : veins beneath
" " lobes	: broadly deltoid-ovate	: oblong-lanceolate	: oblong-ovate
" " apex	: somewhat abruptly : long-acuminate	: acute or short- : acuminate	: long- and sharply : acuminate
" " midlobe	: not constricted	: scarcely to distinctly : constricted at base	: not, or slightly : constricted at base
" " upper sinuses	: very open, rounded at : base	: very open, rounded or : truncate at base	: narrow, rounded or : acutish at base
" " basal sinus:	: deep, narrowly to : broadly 3-angular	: shallow, open 3- : angular or almost : none	: deep and narrow, but : usually open
" " (larger) length	: 10 cm.	: 8.5 cm.	: 10 cm.
" " " width	: 14 cm.	: 11 cm.	: 11 cm.
" " pulvinus:	: large, liver-colored	: very small, brownish : or dull reddish brown:	: large, reddish brown
" " nectaries	: on midvein only, 1.5 : mm. long, sharply de- : fined, deltoid	: often 3, small but : prominent, rounded, : 3-angular or elliptic:	: small, but sharply : defined, usually on : midvein only

<sup>1/</sup> W 64 is Red Acala.

Characters	:	hirsutum (W 64)	:	cernuum (W 15)	:	F <sub>1</sub>
Peduncle	:	about 1.5 cm. long, erect	:	2.5 cm. long, sharply declined even at anthesis	:	8-15 mm. long, erect or ascending
Flower	:	not pendent	:	pendent	:	erect or ascending (?)
Involucel, pubescence:	:	stellate-pubescent on: veins, teeth long- ciliate	:	stellate-puberulent: long	:	sparsely stellate, teeth ciliate
" , color	:	mahogany	:	green tinged with brown-purple	:	reddish brown
" , bractlets	:	connate near base	:	strongly connate	:	rather strongly connate
" " length	:	about 4 cm.	:	3.5 cm.	:	about 4 cm.
" " teeth	:	numerous, long, lan- ceolate, setaceous- acuminate	:	none, or 2 near apex about 1 mm. long	:	rather deeply lacinate with several deltoid- lanceolate, setaceous- acuminate teeth
" nectaries	:	mostly 2, large, transversely elon- gate	:	none	:	none, or rudimentary
Calyx margin	:	deeply dentate with deltoid teeth	:	entire or undulate	:	shallowly dentate, with broad-deltoid, acutish teeth
" nectaries	:	indefinite	:	none, or very rudimentary	:	1 or 2, small, very sharply defined
Corolla, length	:	4.5 cm.	:	3.5 cm.	:	4 cm.
" , petals	:	not ruffled, slightly erose	:	ruffled at apex	:	slightly ruffled
" " color	:	nearly white, rose where exposed	:	nearly white	:	pale yellow, rose where exposed
" " spots	:	none	:	very large, solid	:	fairly large and intense grade 6-7
Filaments, color	:	purplish	:	purplish	:	white
Pollen, color	:	cream	:	light cadmium	:	orange-yellow
Stigmas	:	short but well- exserted	:	not surpassing stamens	:	short but well- exserted

Characters	: hirsutum (W 24)	: Sturtii	: F <sub>1</sub> (W 139)
Fruiting branches	: long, several-flowered, spreading	: short, nearly erect, 1 or 2-flowered	: nearly horizontal, or somewhat ascending, rather long, up to 6-flowered
Bark of twigs	: reddish brown, not glaucous	: reddish brown or pale green, glaucous	: reddish, somewhat glaucous
Stipules	: persistent, 10 to 15 mm. long	: caducous, about 7 mm. long	: somewhat caducous, 9 to 12 mm. long
Pubescence	: sparsely villous with rather long, simple or branched hairs	: none (plant glabrous)	: very sparsely short-stellate, glabrate
Petiole	: stout, equalling or much longer than blade	: slender, 2/3 as long as blade	: rather stout, about equalling blade
Leaf-blades, color	: bright green, not glaucous	: bluish green, very glaucous	: deep green, slightly glaucous
" " , texture	: thickish, rather firm	: thickish, firm	: thickish, firm
" " , lobation	: rather deeply 5-lobed	: entire	: entire to shallowly 3-lobed, lobes deltoid
" " , apex	: abruptly acuminate	: acutish, cuspidate	: short-acuminate, cuspidate
" " , length	: up to 10 cm.	: up to 8 cm.	: up to 10 cm.
" " basal sinus	: deep, often narrow	: very short and narrow	: shallow, narrow near base
" " pulvinus	: large, reddish brown	: very small, often pinkish	: rather large, reddish brown
" " nectary	: small but well-defined, especially on midvein	: elongate, lanceolate; near base midvein	: 1 to 2 mm. long, triangular or elliptic
Involucel, length	: 4.5 to 5 cm.	: about 2 cm.	: 3.5 cm.
" , bractlets	: slightly connate at base	: separate	: separate
" " margin	: deeply lacinate, with numerous, long teeth	: entire or very nearly	: deeply lacinate, with few, lance-subulate, setaceous teeth
" " base	: deeply cordate	: subcordate	: rather deeply cordate

Characters	: hirsutum (W 24)	: Sturtii	: F <sub>1</sub> (W 139)
Peduncle, nectaries	: 2 (or 3 ?) deep, : nearly circular	: 3, often red	: 3, small but deep and : sharply defined, : transversely elongate
Calyx, "	: none, or indefinite	: none	: none
Petals, length	: 4 cm. (not full size)	: 5 to 6 cm.	: ± 5 cm.
" , ciliation	: rather densely cili- : ate near base	: densely ciliate near : base	: densely ciliate near : base
" , color	: nearly white	: pale mauve	: near Tyrian pink
" , spots	: none	: very asymmetric, : deeply feathered	: large, intense, feathered : as in Sturtii
Column, length	: 10 to 15 mm.	: 20 mm.	: 20 mm.
Filaments, length	: about 3 mm.	: 1.5 to 2 mm.	: 3 to 4 mm.
" & anthers, color	: white and deep cream	: near pansy purple	: purple
Pistil length (above ovary):	: 10 to 14 mm.	: 22 mm.	: 25 mm.

Characters	: hirsutum (W 24)	: Thurberi	: F <sub>1</sub> (W 37)
Plant	: glandular-punctate : (leaf-blades rather : obscurely) with dark : glands	: dotted with slight-ly prominent oil-glands	: dotted with black oil-glands, these not prominent
" pubescence	: sparsely villous with : rather long, simple : and branched hairs	: glabrous (soon) ex-cept the ciliate leaf-margins and : puberulent veins	: glabrate (sparsely stel-late puberulent on young parts).
Fruiting branches	: long, several- : flowered, spreading	: short, ascending, : usually forked, : several-flowered	: ascending, or nearly : horizontal
Twigs	: rounded-quadrangular	: quadrangular	: rather sharply quad-rangular
" bark	: reddish brown	: reddish brown, or : tinged therewith	: reddish brown
Stipules	: 10 to 15 mm. long, : persistent	: 6 to 7 mm. long, : extremely fugacious	: 9 to 14 mm. long, : soon deciduous
Petioles	: stout, rounded- : quadrangular	: rather slender, : quadrangular	: rather slender, rounded- : quadrangular
Leaf-blades, length	: up to 10 cm.	: up to 15 cm.	: up to 15 cm.
" " lobation	: rather deeply 5-lobed	: pedately 3-parted, : some 5-parted	: deeply 3- to 5-lobed
" " lobes	: broadly ovate-deltoid	: lance-elliptic or : lanceolate	: oblong-ovate
" " apex	: abruptly acuminate	: attenuate acuminate	: long and sharply : acuminate
" " base	: deeply cordate, basal : sinus often narrow	: subcordate or : cordate	: deeply cordate, basal : sinus narrow or closed
" " pulvinus	: large, reddish brown	: small, greenish or : brownish	: rather large, dull-brown
" " nectary	: small but well-de-fined, especially on : midvein	: 1 to 4 mm. long, on : midvein, triangular : or elliptic	: on midvein only, 1 to 2 : mm. long, triangular, : conspicuous
Peduncle	: 1 to 2 cm. long, : rounded-angular, : slightly furrowed	: 2 to 3 cm. long, : angular, furrowed	: 3 to 4 cm. long, angular, : somewhat furrowed
" nectaries	: 2 (or 3 ?) deep, : nearly circular	: 2 or 3, often large	: 3, large and deep

Characters	: hirsutum (W 24)	: Thurberi	: F <sub>1</sub> (W 37)
Involucrel	: persistent to maturity, erect at anthesis	: persistent to maturity, spreading at anthesis	: persistent, not spreading
" bractlets, length	: 45 to 50 mm.	: 7 to 15 mm.	: 30 mm.
" " base	: slightly connate at base	: separate	: separate
" " shape	: broadly deltoid-ovate; deeply cordate	: lanceolate	: cordate-ovate
" " margin	: deeply lacinate, with numerous, long teeth	: entire or with 2 or 3 very short, sub-late teeth	: very deeply lacinate with numerous lanceolate, setaceous-acuminate teeth
Calyx length at anthesis	: 12 mm.	: ± 4 mm.	: 7 mm.
" nectaries	: none or indefinite	: none	: present, rather indefinite
" margin	: deeply dentate with broadly deltoid, acute teeth	: usually entire or undulate	: shallowly and broadly crenate-dentate
Corolla, shape	:	: rather shallowly cup-shaped	: open-campanulate
" , length	: 40 (or more) mm.	: 25 to 30 mm.	: ± 40 mm.
" , petals	: rather densely ciliate at base	: densely ciliate on claws	: densely long-ciliate on claws
" " spot	: none	: faint, striate, or none	: none
Pistil (length above ovary):	: 10 to 14 mm. (21, 23)	: about 18 mm. (20)	: 22 mm. (26-28)
" exerted portion (proportion)	: 5 mm. long, or less; about 1/3	: about 1/2 as long as column 1/3	: about 2/3 as long as column nearly 1/2
" color	: cream with dark brown oil-glands	: pale green with deeper green oil-glands	: nearly white, with nearly black oil-glands
Filaments (lower) length	: 3.5 mm.	: 3 to 4 mm.	: 3 to 4 mm.
" color	: white	: white	: white
Anthers, color	: cream	: cream	: cream
" connective	: yellowish	: yellowish	: yellowish
Pollen color	: white	: cream	: very pale yellow (scarcely any)
Column length	: 10-16 mm.	: ± 13 mm.	: 14-16 mm. (3/3 to 3/4)
Protheca, position	: anthers nearly to base	: nearly 2/3	: 2/3 to 3/4

Characters	: hirsutum (W 64) <sup>1/</sup>	: tomentosum	: F <sub>1</sub> (W 80)
Twigs, petioles, leaf-blades and involucels	: copiously long-villous : with branched or : simple hairs	: densely whitish : tomentose	: grayish tomentose, hairs : longer than in tomento- : sum
Bark, twigs	: dark red-brown, be- : coming nearly black	: green	: dark reddish brown
Leaf-blades, color	: bronze-purple :	: bluish, then grayish :	: grayish green, tinged : with red
" " , lobes	: broadly deltoid-ovate, : somewhat abruptly : long-acuminate	: ovate or oblong-ovate, : short-acuminate :	: oblong-ovate, acuminate :
" " , nectaries	: on midvein only, : small, sharply : defined	: none	: near base of midvein : only, very small to : rather conspicuous
Involucel, length	: + 40 mm.	: 25 to 30 mm.	: 35 to 37 mm.
" , bractlets	: connate near base :	: connate only very near: : base	: separate or very : slightly connate
" " margin	: deeply laciniate, : teeth numerous, long, : lanceolate, : setaceous-acuminate	: shallowly dentate on : nearly whole margin, : teeth short, deltoid- : subulate	: rather deeply laciniate : with numerous long, : deltoid-lanceolate, : setaceous teeth
" external nectaries	: 2 or 3, large, nearly: : circular or trans- : versely elongate	: none	: mostly rudimentary, : sometimes well-defined
Calyx, length	: 11 mm.	: 4 to 5 mm.	: about 7 mm.
" , margin	: deeply dentate, with : deltoid, acute or : acutish teeth	: entire	: undulate or very shal- : lowly crenate, teeth : broadly deltoid, obtuse
" , nectaries	: indefinite	: none	: none, to well-developed
Corolla, shape	: funnelform-campanulate	: very open-campanulate	: funnelform-campanulate
" , length	: 4 to 4.5 cm.	: 3.5 cm.	: 4.5 to 5 cm.
Petals, color(fresh)	: nearly white, rose- : colored where exposed	: brilliant lemon- : yellow	: light yellow (paler than : in tomentosum)
" " (faded)	: deep rose	: changing color only : slightly	: deep rose
"	: not glossy, not ruffled, : slightly erose	: glossy, ruffled	: not glossy, scarcely : ruffled

<sup>1/</sup> W 64 is Red Acala.

Characters	: hirsutum (W54)	: tomentosum	: F <sub>1</sub> (W 80)
Filaments	:: slender, about 3 mm. : long	: long, slender, about: : 4 mm. long	: very slender, up to : 7 mm. long
" color	: white	: yellowish	: ochroleucous
Pollen, color	: cream	: cream, then pale- : yellow	: pale yellow
Pistil	: stout	: very slender	: slender
" , exertion	: short-exserted, not : surpassing upper : stamens	: long-exserted, : exerted portion : often = column	: exerted portion = or : longer than column
Stigmas	: about 4 mm. long, : coherent	: very short, some- : times separate	: elongate, coherent

Characters	: Nanking (824)	: Thurberi	: F <sub>1</sub>
Fruiting branches	: long, slender, : spreading or slight- : ly drooping	: short, ascending, : usually forked, : several-flowered	: of intermediate length, : spreading or drooping
Bark of twigs	: brown, becoming : nearly black	: reddish brown or : tinged therewith	: brown, becoming nearly : black
Branchlets & petioles	: densely cinereous- : puberulent and long- : villous	: soon glabrous	: very sparsely and very : short-stellate puberu- : lent, no long hairs
Plant	: inconspicuously : dark-punctate	: dotted with slightly : prominent oil-glands	: very obscurely dark : punctate
Twigs and petioles	: terete or nearly so	: quadrangular	: rounded 3-angular or : quadrangular, petioles : often somewhat com- : pressed
Leaf-blades, pubescence	: short-ciliate, sparse- : ly very short stel- : late pubescent and : sparsely villous on : veins beneath, with : mostly simple hairs : becoming glabrate : above	: margins ciliate, : veins puberulent	: puberulent like twigs, : then glabrate
" " color	: deep green above with : pinkish veins, veins : dark red beneath	: bright green	: dark green, veins : pinkish above, reddish : brown below
Stipules	: 8 to 10 mm. long, : lanceolate, persist- : ent	: 6 to 7 mm. long, : subulate, extremely : fugacious	: 6 to 7 mm. long, lance- : subulate, fugacious, : but less so than in : Thurberi
Petioles	: becoming deflexed!	: often somewhat de- : flexed	: often slightly deflexed.
Leaf-blades, lobation	: rather deeply 5-lobed	: pedately 5-parted	: very deeply 5-lobed
" " , lobes	: oblong-ovate	: lance-elliptic or : lanceolate	: oblong-lanceolate
" " apex	: short-acuminate, : mostly sharply so	: attenuate-acuminate, : often setose at tip	: sharply acuminate, often : setose-tipped
" " , sini	: exceptionally very : short-toothed in : upper sini	: not toothed in sini	: not toothed in sini

Characters	Nanking (824)	Thurberi	F <sub>1</sub>
Leaf-blades, upper sin	: broad, rounded at base	: very narrow, acutish : at base	: very narrow, but obtuse : at base
" " midlobe	: slightly constricted : at base	: strongly constricted : at base, often as if : stalked	: strongly constricted at base, but less than in : Thurberi
" " length	: up to 7 cm.	: up to 15 cm.	: up to 10 cm.
" " basal lobes	: divergent	: usually moderately to : strongly reflexed	: divergent or somewhat : reflexed
" " nectary	: very small, less than : 1 mm., usually on : midvein only, circu- : lar, short-elliptic : or broadly triangu- : lar, well defined	: 1 to 4 mm. long, tri- : angular or elliptic	: on midvein only, 3- : angular, 1 to 2 mm. : long
Peduncle	: declined usually : before anthesis, : terete or nearly, : not furrowed	: erect or ascending, : angular, furrowed	: erect, ascending or : spreading, strongly : angled, furrowed
Involucel, bractlets	: nearly separate to : strongly connate, : not spreading	: separate, spreading	: separate, or slightly : connate, erect or : nearly so, <del>erect</del>
" " shape	: cordate-ovate	: lanceolate	: ovate, shallowly cordate
" " length	: 25 mm.	: 7 to 15 mm.	: 17 to 20 mm.
" " margin	: with few very short : teeth near apex	: entire, or with 2 or 3 : short subulate teeth	: rather deeply 3 to 5- : toothed but not to the : middle, teeth 3- : angular-lanceolate, : setaceous-tipped
Calyx margin	: entire or undulate : (sometimes dentate?)	: usually entire or : undulate	: undulate or very : shallowly crenate
" length at anthesis	: 4 mm.	: 4 mm.	: about 2.5 mm.
" nectaries	: very large, inverted : delta-shaped	: none	: none or indefinite
Corolla, shape and length	: (usually pendent)? : about 25 mm.	: rather shallowly cup- : shaped, 25 to 30 mm. : long	: campanulate : 25 mm.

Flowers, position      pendent      erect

nodding/pedicels  
horizontal or  
slightly deflexed

Characters	: Nanking (824)	: Thurberi	: F <sub>1</sub>
Corolla, petals	: ciliate not very : densely, near base	: densely ciliate on : claws	: copiously ciliate near : base
" "	color : picric-yellow	: white	: nearly white
" "	spots : large, solid :	: none, or faint, : striate	: grade 7 or 8 :
Pollen, color	: light cadmium or : bright yellow	: cream	: orange
Pistils, color	: whitish, with yellow : oil-glands	: pale green, with : deeper green oil-glands	: pale green with brown : oil-glands
Column, length	8 mm.	11 to 13 mm.	± 13 mm.
" proportion stamiferous	1/2	1/2	about 1/2
Filaments (lower) length	2 mm.	3 to 4 mm.	3.5 mm.
Pistil, length	16 mm.	20 mm.	18 to 20 mm.
" proportion exerted	nearly 1/2	about 1/3	1/4 to 1/3

: peruvianum (662) : Darwinii (702) : F<sub>1</sub>

---

These two forms (C.B. 662 and 702) are practically identical in leaf characters. In both, the older leaf-blades are dotted above with lighter colored dots. This is not strictly an inter-species hybrid.

Characters	purpurascens	tomentosum	F <sub>1</sub>
Bark of twigs and petioles	: dark purple, nearly black, <i>shiny, warty</i>	: pale green, not shiny, not warty	: dark purplish brown, not shiny, not warty
Twigs, pubescence	: soon glabrous	: whitish tomentose with extremely short hairs	: densely soft pubescent, hairs longer than in tomentosum
Petioles, "	: glabrate	: like the twigs	: like the twigs
"	: much longer than the blades	: about equalling the blades	: about equalling the blades
Leaf-blades, color	: deep green tinged with purple and with red-dish purple veins, these much deeper-colored beneath	: bluish, then grayish-green	: lighter green than in purpurascens, tinged with purple and purple-veined
" " , glands	: rather conspicuously (beneath) but sparsely black-punctate	: sparsely and inconspicuously black-punctate beneath	: rather conspicuously dark-punctate
" " pubescence	: sparsely to rather copiously pubescent on both faces, especially on the veins, with rather long hairs	: densely whitish tomentose with very short hairs	: like the twigs
" " , length	: up to 13 cm. (probably often longer)	: up to 12 cm.	: up to 15 cm.
" " , lobation	: deeply 5-7-lobed	: rather deeply 5-lobed	: deeply 5-lobed
" " , lobes	: ovate or oblong-ovate, often coarsely dentate	: ovate or oblong-ovate	: lance-ovate or oblong-ovate
" " apex	: sharply short-acuminate	: short-acuminate, usually acutely so	: sharply acuminate
" " pulvinus	: large, liver-colored	: small, pale green	: large, purplish brown
" " nectaries	: 1 to 3, large and deep; triangular-elliptic or elongate, up to 10! mm. long	: none	: small, ± triangular, near base of midvein only, often poorly defined or none

Characters	: purpurascens	: tomentosum	: F <sub>1</sub>
Involucel, bractlets	:	: connate only very : near base	: slightly connate :
" " shape	:	: oblong or oblong- : ovate	: oblong-ovate :
" " margin	:	: dentate on nearly : whole margin, teeth : short, deltoid- : subulate	: teeth few, long, lance- : subulate, setaceous- : acuminate :
" bractlets, nectaries	:	: none :	: 2 or 3, well-defined :
Calyx margin	:	: entire	: entire or undulate
" oil-glands	:	: rather numerous, black	: numerous, black
Corolla, shape	:	: very open-campanulate:	
Petals, color	:	: brilliant lemon- : yellow	: clear yellow, paler than : tomentosum
" surface	:	: glossy	: not glossy
" spots	:	: spotless	: spotless
Filaments	:	: long and slender, : yellowish	: long
Pollen, color	:	: cream, changing to : pale yellow	: yellow, about same color : as petals
Stigmas	:	: long exserted, very : slender	: very long, equalling or : longer than column, oil- : glands numerous, black

Characters	: sanguineum	: africanum	: F <sub>1</sub>
Twigs and petioles	:densely villous- : hirsute with long, : mostly simple hairs	:copiously villous- : hirsute with very : long hairs	:copiously villous- : hirsute with very long, : mostly simple hairs
Bark of twigs	:dark brown, becoming : nearly black	:green, becoming : reddish brown	:reddish brown, becoming : near black
" , older	: light brown	:green, with very : numerous light-brown : lenticels	: as in africanum
Leaf-blades, pubescence	:short-stellate and : long villous on veins : especially beneath	:copiously soft- : stellate, pubescent : on both faces, : sparsely long-villous : on veins beneath	: as in africanum
" " texture	: rather firm	: rather soft	: intermediate
" " color	:rather light green, : tinged with purple : and with reddish veins	:yellowish, becoming : deep green above, : veins not colored	: as in africanum
" " (larger) length	: 8.5 cm.	: 9 cm.	: 8.5 cm.
" " " width	: 8 cm.	: 12 cm.	: 9 cm.
" " lobation	:deeply 5-lobed	:rather shallowly : 5-lobed	: deeply 5-lobed
" " lobes	:oblong-lanceolate or : ovate-oblong	:broadly ovate or : nearly orbicular	:ovate or oblong-ovate
" " apex	:sharply short-acumi- : nate	:usually acutish, : often mucronate	:short acuminate, often : mucronate
" " midlobe	:up to 27 mm. wide : somewhat constricted : at base	:up to 55 mm. wide, : distinctly con- : stricted towards base	:up to 40 mm. wide, : constricted at base
" " nectary	: none	: on midvein only, : small but prominent	: on midvein only, very : small but distinct
Peduncle	:erect or spreading, : often somewhat : decurved after anthe- :	:ascending or spread- : ing before anthesis, : sometimes decurved : afterward	: as in parents
Involucel, color	: bronze-purple	: green	:green tinged with purple
" bractlets, base:	: subcordate	: deeply cordate	: deeply cordate

Characters	: sanguineum	: africanum	: F <sub>1</sub>
Involucel, bractlets, margin	: entire or very shallowly few-toothed near apex, teeth very few and very short, 3-angular-subulate	: deeply laciniate on most of margin with 3-angular-lanceolate-setaceous teeth	: rather deeply lacinate on most of margin, teeth triangular-setaceous
Calyx, nectaries	: none	: usually present, large, inverted delta-shaped	: large, functional, inverted delta-shaped
Petals	: only slightly ruffled	: conspicuously ruffled	: conspicuously ruffled
" color	: spinel-red above, whitish below	: pale or bright yellow	: pomegranate-purple above, yellowish below
" spots	: occupying nearly 1/2 of petal	: occupying 1/4 to 1/3 of petal	: solid, intermediate in size
Anthers, color	: purplish brown	: near xanthine-orange	: pale orange, tinged with red
Pollen, "	: pale yellow	: orange	: orange

Filaments (lower) length ± 2.5 mm.  
 " color purplish

2 mm.  
 white or slightly purple-tinged

2 mm.  
 purplish

Characters	: sanguineum	: Stocksii	: F <sub>1</sub>
Stem	: erect, vegetative : branches ascending	: low, branches : trailing	: erect, vegetative : branches numerous, : wide-spreading
Fruiting branches	: slender, short, spread- : ing or slightly : decurved		: slender, wide-spreading : or somewhat drooping
Bark of twigs	: dark brown, becoming : nearly black		: like sanguineum
Petioles, pubescence	: densely villous-hirsute : with long, mostly : simple hairs	: sparsely stellate- : puberulent	: copiously short- : pubescent, hairs : mostly stellate
Leaf-blades, pubescence	: short-stellate, and : long-villous on veins, : especially beneath	: like the petioles	: rather copiously : short-stellate- : pubescent
" " (larger) length	: 8.5 cm.	: 3.5 cm.	: 8 cm.
" " " width	: 8 "	: 4.5 "	: 10 "
" " lobes	: oblong-lanceolate or : ovate-oblong, sharply : short-acuminate at : apex	: nearly orbicular, : very obtuse or trun- : cate at apex, : mucronate	: deeply 5-lobed, lobes : oblong-ovate, acute, : and mucronate at apex, : often several-cleft
" " basal sinus	: broad and very shallow: : open, or almost none	: shallow and broadly : triangular, or : rather deep & narrow:	: shallow or deep, : broadly 3 angular, open
" " upper sinuses	: deep and narrow, : rounded at base	: deep and narrow, : closed by overlap- : ping	: open, but often closed : by overlapping above : the rounded base
" " pulvinus	: conspicuous, reddish : brown	: very small, scarcely : colored	: greenish, or tinged : with brown
" " nectary	: none	: minute, well above : base, or none	: one, very small but : sharply defined on : midvein or lateral, : more often none
Involucel, color	: bronze-purple	: green	: purplish brown
" length	: 25 mm.	: 20 to 23 mm.	: 20 mm.

Characters	: sanguineum	: Stocksii	: F <sub>1</sub>
Bractlets	: strongly connate, : not clawed	: separate, : clawed	: separate, not clawed, : deeply cordate
" , margin	: entire, or very shallowly : lowly few-toothed : near apex	: very deeply lacinate, : ate, 1/2 way to : base, or more	: deeply lacinate with : numerous teeth on : nearly whole margin
" teeth	: very few and very : short, near apex, : subulate	: subulate, setaceous- : acuminate	: fairly long, lance- : subulate, setaceous- : acuminate
" nectaries	: none, or rudimentary :	: present, but apparently : non-functional	: 3
" pubescence	: rather sparsely : pubescent	: sparsely puberulent :	: stellate-puberulent :
Calyx, pubescence	: glabrous	: rather densely : short-pubescent	: short-stellate :
" margin	: shallowly dentate with : broadly deltoid, : acutish teeth	: deeply dentate, : with long, subulate : teeth triangular at : base	: short-dentate with : deltoid-subulate, : acute teeth
" oil-glands	: few, conspicuous :	: very few and small, : black	: very few :
Petals, length	: 30 mm.	: 20 to 25 mm.	: 30 to 35 mm.
" color	: spinel-red above, : whitish below	: near sulphur yellow :	: deep rose :
" spots	: huge, occupying nearly : 1/2 of petal, very : intense	: rather large (6 to : 8 mm. long) but not : very solid	: fairly large and intense :
Pollen, color	: pale yellow :	: paler than baryta : yellow	: deep cream :
Pistil, length	: 15 mm.	: about 12 mm.	: 12 mm.
Stigmas	: barely exerted	: well-exserted	: short but exerted
Filaments, length (lower)	$\pm 2.5$ mm.		$\pm 2$ mm.
" color	purplish		white tinged with purple

Characters	Sturtii	Armourianum	F <sub>1</sub> <sup>1/</sup>
Plant, pubescence	: glabrous except petals	: obscurely puberulent:	: minutely granular-
	:	: soon glabrous	: puberulent on very
	:	:	: young parts, very
	:	:	: soon glabrous
Fruiting branches	: very short, strongly	: very short (1 to	: mostly not more than
	: ascending, mostly	: 4 cm.) the flower	: 15 cm. long and
	: 1-flowered	: usually solitary	: 2 or 3-flowered,
	:	: and appearing	: ascending
	:	: terminal, peduncle :	
	:	: articulated	:
Bark of twigs	: pale green or reddish	: reddish, somewhat	: reddish, glaucous
	: brown, glaucous	: glaucous	:
Bark, older	: light grayish brown	: light reddish brown	: darker than in Sturtii,
	:	:	: grayish brown
Stipules	: about 7 mm. long,	: 1.5 to 2.5 mm. long,	: 3 to 4 mm. long,
	: lanceolate, caducous	: subulate, fugacious:	: lance-subulate,
	:	:	: fugacious
Leaf-blades, color	: bluish green, very	: dark or yellowish :	: intermediate
	: glaucous	: green, not glaucous:	
" " length	: up to 8 cm.	: 2 to 3.5 cm.	: up to 5.5 cm.
" " surface	: not shiny	: shiny on both faces :	: not shiny, except
	:	:	: when very young
" " shape	: ovate, acutish,	: rounded-deltoid,	: broadly ovate, acute <sup>sl</sup>
	: cuspidate	: obtuse or acutish, :	: <del>and</del> abruptly very
	:	: often mucronate	: short-acuminate,
	:	:	: mucronate
" " basal sinus	: very short and narrow	: open, broadly tri-	: very short or almost
	:	: angular	: none; open
" " pulvinus	: pinkish	: greenish or brownish:	: pinkish
Peduncle	: very short, terete,	: terete(?), striate	: terete, scarcely striate,
	: not striate	:	: about 1 cm. long
Involucl	: persistent to maturity	: deciduous long	: more persistent than
	:	: before anthesis	: in Armourianum
" bractlets, length:	about 20 mm.	: 2 to 5 mm.	: about 12 mm. ( <sup>7/15</sup> )
" " , shape	: broadly ovate or oblong:	: subulate or narrowly:	: widely separate, broadly
	: ovate, short-acuminate:	: lanceolate, acumi-	: lanceolate, entire or
	: and cuspidate	: nate	: minutely very few-
	:	:	: denticulate near apex,
	:	:	: acuminate

1/ Flower characters from herbarium specimens. The flower-buds nearly always shed before anthesis.

Characters	Sturtii	Armourianum	F <sub>1</sub>
Involucel ext.			: 3 large, rounded-
nectaries	: 3, usually red	: none	: inverted-delta-
			: shaped or nearly
			: circular
Calyx at anthesis,			
length	: 6 mm.	: 5 to 10 mm.	: 6 to 7 mm. (10 mm.)
" " " , margin	: dentate with triangu- lar-subulate teeth	: like Sturtii	: <sup>deeply</sup> dentate with subulate teeth
Petals, length	: 5 to 6 cm.	: 2.5 to 4.5 cm.	: 3 cm. (4 cm.)
" color	: pale mauve	: pale-green yellow	: <sup>pinkish</sup> pinkish buff, rose when exposed in bud
" spots	: about 15 mm. long, conspicuously feathered	: 5 to 10 mm. long, solid or striate, or: wanting	: about 9 mm. long, feathered as in Sturtii
Anthers, connective	: bordered with deep red	: bordered with car- mine or dark purple	: bordered with deep color (carmine?)
Filaments and anthers	: both pansy-purple	: filaments often pur- plish, anthers pale	: <sup>filaments purple</sup> filaments purple <sup>anthers pale orange</sup> anthers pale orange
Pollen, color	: cream	: near apricot-yellow	

The additions in pencil are from notes at Palm Springs  
April 1938

✓ appearing pale yellow in small buds, of about the  
size when they usually fall.

Characters	Sturtii	Harknessii	F <sub>1</sub>
Plant, pubescence	: glabrous, except : petals :	: densely puberulent :	: obscurely granular- : puberulent on very young : parts, soon glabrous
Fruiting branches	: very short, strong- : ly ascending, : mostly 1-flowered :	: 1 to 4 cm. long, : flower usually soli- : tary and appearing : terminal	: up to 10 cm. long, : ascending, usually : 1-flowered
Bark of twigs	: pale green or red- : dish brown, very : glaucous	: greenish or brownish, : not glaucous :	: reddish brown, somewhat : glaucous
Leaf-blades, color	: bluish green, very : glaucous	: yellowish green, : not glaucous	: light green, slightly : glaucous
" " length	: up to 8 cm.	: 3 to 6 cm.	: up to 5 cm.
" " lobation	: entire	: shallowly 3-lobed	: entire to rather deeply : 3-lobed (much more than : in Harknessii.)
" " shape	: ovate, acutish, : cuspidate : :	: broadly deltoid, : short-acuminate or : acutish and micro- : nate	: broadly deltoid, subcor- : date, acuminate
" " pulvinus	: very small, reddish : or pinkish	: very small, greenish : or brownish	: very small, brownish : or pinkish
Peduncle	: very short, terete, : not striate :	: quadrangular(?) : striate :	: less than 1 cm. long, : terete, scarcely : striate
Involucl	: persistent to : maturity :	: deciduous at, or : shortly before, : anthesis	: more persistent than : in Harknessii
" bractlets, length	: ± 20 mm.	: 10 to 25 mm.	: 22 to 25 mm.
" " margin	: entire, or very : nearly so. :	: entire to few- : dentate near apex :	: undulate or very few- : denticulate or dentate : near apex
" " base	: narrowed :	: somewhat narrowed : and rounded	: narrowed
" ext. nectaries	: 3, usually red :	: none	: 3, rather large, in- : verted delta-shaped : or nearly circular

Characters	Sturtii	Harknessii	F <sub>1</sub>
Calyx at anthesis, length	6 mm.	6 to 8 mm.	about 7 mm.
" " " margin	dentate with 3- angular-subulate teeth	undulate or denticulate	dentate with deltoid, very acute teeth
" oil-glands	numerous, prominent, black	few, greenish	numerous, prominent, black
Petals, length	3.5 to 6 cm.	3 to 5 cm.	2.5 to 5 cm. <sup>1/</sup>
" color	pale mauve	light green-yellow	rather dingy color, between rose pink and hellebore red
" margin	slightly erose, scarcely ruffled	conspicuously ruffled	slightly erose, scarcely ruffled
" spots	about 15 mm. long, conspicuously feathered	none	about 10 mm. long like Sturtii, but less feathered
Anthers, connective	bordered with deep red	bordered with carmine, or some- times not	whole anther brownish purple
Filaments, length of lower	1.5 to 2 mm.	3 mm.	1 to 1.5 mm.
" , color	purple	whitish	purplish
Pollen, color	cream	apricot yellow to light cadmium	yellow
Column, length	17 mm.	± 17 mm.	12 mm.
<i>Pistil length</i>	<i>20-25 mm.</i>		<i>18 mm.</i>
<i>" proportion exserted</i>	<i>-1/3</i>		<i>+ 1/4</i>
<i>" color</i>	<i>white</i>	<i>white</i>	<i>white</i>
<i>" oil-glands</i>	<i>black (dark purple)</i>	<i>pale brown</i>	<i>dark-purple (nearly black)</i>

<sup>1/</sup> Not more than 2.5 cm. in 1937.

Characters	Thurberi	Sturtii	F <sub>1</sub>
Twigs and petioles	: quadrangular	: rounded, but some- : what compressed	: rounded-quadrangular
" " "	: glabrate	: glabrous	: very soon glabrous
Bark of twigs	: reddish brown, or : tinged therewith, : not (?) glaucous	: pale green or reddish: : brown, glaucous	: green tinged with red, : somewhat glaucous
Leaf-blades, texture	: thin	: thickish	: thickish
" " color	: bright green	: bluish, very glaucous:	: green, slightly glaucous
" " pubescence	: ciliate and puberu-: : lent on veins	: glabrous	: minutely pruinose when : very young, soon glabrous
" " length	: up to 15 cm.	: up to 8 cm.	: up to 9 cm.
" " lobation	: pedately 3- to : 5-parted	: entire	: entire to deeply and : narrowly 3-lobed
" " <i>a/pex</i>	: attenuate-acuminate, : sometimes setose- : tipped	: acutish, cuspidate	: long-acuminate, setose : at apex
" " basal sinus	: very open, triangular:	: very short and : narrow	: very shallow, narrow : but usually open at base
" " pulvinus	: small, greenish or : brownish	: very small, pinkish	: very small, greenish : brown
Peduncle	: up to 2 cm. long, : sharply angular and : furrowed	: very short, terete, : not furrowed	: as in Thurberi
Involucel at anthesis:	spreading	: somewhat spreading	: somewhat spreading
" bractlets,	:	:	:
length	: 7 to 15 mm.	: 20 mm.	: 17 to 19 mm.
" " shape	: lanceolate	: broadly ovate, or : oblong-ovate	: rather broadly lanceolate
" " margin	: entire or 2 or 3- : dentate with short : subulate teeth	: entire or very nearly:	: entire or with 1 or 2 : triangular-setose teeth
Calyx at anthesis,	:	:	:
length	: ± 4 mm.	: 6 mm.	: 5 to 6 mm.
" " " margin	: usually entire or : undulate	: dentate with triangu- : lar-subulate teeth	: abruptly dentate with : deltoid-subulate, : very acute teeth

Characters	Thurberi	Sturtii	F <sub>1</sub>
Corolla, shape	: shallowly cup-shaped	: open-campanulate	: open-campanulate
Petals, length	: 25 to 30 mm.	: 35 to 60 mm.	: 35 to 40 mm.
" , color	: white	: pale mauve	: between white and pale : amaranth-pink
" , margin	: slightly erose	: slightly erose, not : ruffled	: shallowly erose and : slightly ruffled
" , spot	: striate, or none <sup>1/</sup>	: 12 to 15 mm. long, : feathered	: 12 to 13 mm. long, like : Sturtii but larger : relative to petal
Filaments, length	: 3.5 to 4 mm.	: 1.5 to 2 mm.	: about 2.5 mm.
" , color	: white ( <del>?</del> )	: purple	: purple
Anthers, color	: cream-colored with : dull orange connect- : ive	: pansy-purple	: daphne pink : :
Pistil, color	: pale green, with : deeper green oil- : glands	: white, with black : oil-glands	: white, with black : oil-glands, <sup>these few</sup> : dark-purple (nearly)

<sup>1/</sup> The 2 plants of Thurberi in 1937 have spotless petals.

Gossypium, Interspecies Hybrids, F<sub>1</sub>  
Rubidoux Laboratory, Riverside, July-September, 1934.

barbadense x harknessii <sup>F<sub>1</sub></sup>

W 36 (2 plants) and W 38 (2 plants). All of these are much alike and show more barbadense than harknessii characters.<sup>1/</sup> Plants large (up to 10 feet high) and limby, with long fruiting branches and vegetative branches at many of the upper nodes. Stems decidedly woody, twigs reddish-brown. Petioles less densely puberulent than in harknessii, with longer hairs. Leaf blades barbadense-like but smaller, the larger ones deeply 5-lobed, puberulent, especially on the veins, with short, stellate hairs, with a deeper-colored pulvinus than in barbadense and with a small deltoid or lanceolate nectary on the midvein towards base. Involucel large, hirsutum-like, showing no sign of falling at anthesis, the bractlets deeply lacinate with broad teeth, separate or nearly so. Flowers much larger than in harknessii. Calyx ciliolate, with undulate margin and numerous black oil glands. Petals pale green-yellow (V)<sup>2/</sup> in W 36, between <sup>w</sup>Martins yellow and picric yellow (IV) in W 38, the spots large but rather faint. Filaments purplish. Anthers light cadmium (IV), their connectives not colored or occasionally with a few purple oil glands bordering the anther cell. Pistil (exserted portion) equalling or surpassing the stamiferous portion of the column. Oil glands of the very young bolls reddish brown. The two last characters apparently are derived from harknessii.

---

<sup>1/</sup> It appears that, in crosses with G. harknessii, barbadense is more "prepotent" than hirsutum (see harknessii x hirsutum).

<sup>2/</sup> The Roman numerals in parentheses refer to the plates in Ridgway.

Gossypium, Interspecies Hybrids, F<sub>1</sub>  
Rubidoux Laboratory, Riverside, July-September, 1934

barbadense x punctatum F<sub>1</sub>

W 53 (2 plants) and W 54 (1 plant). Plants much as in barbadense x hirsutum F<sub>1</sub>, nearly glabrous except on the very young parts. Petals approximately <sup>4</sup>Martins yellow (IV), with rather faint, striate spots. Filaments not colored. Pollen between apricot yellow and light cadmium (IV) in W 54, near empire yellow (IV) in W 53. Pistil (exserted portion) short in comparison with hybrids between armourianum or harknessii and cultivated American cottons. Bolls 3-5 lock, their surface smooth and light-colored.

barbadense x schottii <sup>3/</sup>F<sub>1</sub>

W 46 (2 plants) and W 49 (2 plants). Plants glabrous or nearly so except on the very young parts. Stems dark purple. Leaf blades (larger ones) deeply and narrowly 5-lobed but not more so than in barbadense, much less so than in typical schottii. Flowers very like those of barbadense x hirsutum F<sub>1</sub>. Involucl of intermediate character. Calyx with merely undulate margin and many oil glands. Petals pale green-yellow (V) with fairly pronounced spots. Filaments not colored. Pollen between empire yellow and lemon-chrome (IV). Bolls mostly 4-lock, pointed, rather deeply pitted, with short but pronounced apical furrows.

---

<sup>3/</sup> The "G. schottii" parent is probably a hybrid, with some other form, having less incised leaves than schottii.

Gossypium, Interspecies Hybrids, F<sub>1</sub>  
Rubidoux Laboratory, Riverside, July-September, 1934

barbadense x sturtii F<sub>1</sub>

W 33 (4 plants) and W 57 (3 plants). All of these plants are much alike in corolla characters but show more variation in the characters of the leaves, involucrel and calyx than the individuals of any other interspecies combination. Plants glabrous throughout or very nearly so, large, up to 11 feet high, resembling sturtii in their rather stiff habit, with long, nearly erect vegetative branches. <sup>4/</sup> Fruiting branches with very long internodes. Young bark reddish brown (green in sturtii) glaucous (as in sturtii). Leaf blades not glaucous, from rather light to dark green with a dark brown pulvinus, sometimes pronouncedly crinkle-margined (W 33 A), the larger ones varying, on different plants, from deeply and rather narrowly 5-lobed to much more shallowly and broadly 3-lobed, with large, lanceolate or deltoid nectaries ~~at~~ <sup>near</sup> the base of the midvein or (in some of the plants) of all 3 principal veins. Stipules long and narrow, clustered at the ends of the branches, as in sturtii. Involucrel glabrous, 1/2 to 2/3 as high as the corolla, the bractlets separate to the base, more or less deeply lacinate with few or rather numerous subulate, setose-tipped teeth, with a nectary at the base of one or more of the bractlets. Flowers very large and handsome. Calyx ciliolate, with numerous oil glands, sharply dentate, the deltoid-subulate teeth varying in length on different plants, often as long as the height of the undivided portion. Petals densely ciliate towards base, between Tyrian pink and rose-color (XII) with very large, intense, feathered spots of sturtii character (pin-wheel effect) and varying from pomegranate-purple to Bordeaux (XII) in color. Column very long and staminiferous nearly to its base, as in sturtii. Filaments purple. Anthers reddish. Pollen yellow. Pistil long-exserted but the exserted portion much shorter than the staminiferous part of the column.

<sup>4/</sup> But differ from sturtii in their much more open habit, fewer stems and long, ascending fruiting branches with very long internodes, the ~~curst~~ <sup>curst</sup> ~~intertricle~~ <sup>intertricle</sup> often 1 foot long.

*barbadense* x *Sturtii* F<sub>1</sub>

Gossypium, Interspecies Hybrids, F<sub>1</sub>  
Rubidoux Laboratory, Riverside, July-September, 1934

contextum x armourianum F<sub>1</sub>

Photo by Peables, in 1936, # 144

W 56 (2 plants). Very similar to hirsutum x armourianum in all characters.

Leaf blades quadrangular in outline, the larger ones shallowly 3-lobed with short-acuminate lobes, nearly glabrous, with a very small nectary on the midvein towards base. Involucel with the bractlets widely separated, oblong, narrowed at base, very deeply lacinate with a few narrowly lanceolate or subulate, setose-tipped teeth that equal in length the undivided portion of the bractlet. Calyx dentate with deltoid-setose teeth nearly or quite as long as the height of the undivided portion, and with very numerous oil glands. Petals lighter than Martius yellow (IV) tinged with red on the exposed portion and fading rose-color (XII), the large, rather intense spots pomegranate-purple (XII). Filaments, at least the lower ones, purple. Pollen light cadmium (IV). Pistil (exserted portion) very long, equalling or longer than the stamiferous portion of the column.

contextum x hopi F<sub>1</sub>

W 26 (3 plants). Young stems, petioles and peduncles hirsute. Leaf pulvinus liver-colored. Petals spotless, pale green-yellow (V). Pollen between baryta-yellow and pinard yellow (IV). Bolls, lint and the nearly naked seeds much as in G. hopi.

contextum x Schottii F<sub>1</sub>

W 51 (2 plants). Stems and petioles very dark purple, this color (Schottii character) showing also in the leaf-veins and involucels. Leaf-blades deeply and narrowly lobed. Petals spotless, lighter than Martius yellow (IV). Anthers (pollen?) approximately empire yellow (IV). Bolls 4-lobed, somewhat tapering at apex, very smooth, with short but pronounced apical furrows.

Gossypium, Interspecies Hybrids, F<sub>1</sub>  
Rubidoux Laboratory, Riverside, July-September, 1934

contextum x schottii <sup>5/</sup>

W 51 (2 plants). Stems and petals <sup>ideas</sup> very dark purple, this color (schottii character) showing also in the leaf veins and involucels. Leaf blades deeply and narrowly lobed. Petals spotless, lighter than <sup>IV</sup> Martins yellow (IV). Anthers (pollen ?) approximately empire yellow (IV). Bells 4-lobed, somewhat taper-pointed, very smooth, with short but pronounced apical furrows.

dauidsonii x sturtii F<sub>1</sub>

W 59 (1 plant). Plant very open, with few ascending branches, intermediate in the angle of the branches but very different from either parent in having very few branches, obscurely puberulent towards the apex of the petiole, on the pulvinus and near the base of the leaf veins, otherwise glabrous or very nearly so. Twigs reddish but less so than in dauidsonii (green in sturtii), glaucous, older bark grayish brown. Leaf blades glaucous but much less so than in sturtii, all entire or occasionally with a very short tooth, broadly ovate, short-acuminate (abruptly apiculate in sturtii), <sup>pulvinus very small, brown.</sup> subcordate, <sup>or lanceolate,</sup> involucrel nearly intermediate, about 1/2 as high as the corolla, obscurely ciliolate, otherwise glabrous, the bractlets quite separate, oblong-ovate, with a few short, deltoid, <sup>setose-tipped</sup> teeth. Calyx dentate with deltoid, obtuse to setose-acuminate teeth and with fairly numerous oil glands. Corolla small, about <sup>35 mm</sup> 1 1/2 inches high. Petals pale rhodonite pink (XXXVIII), the spot sturtii-like, pomegranate-purple (XII). Column much as in sturtii, long, the stamiferous portion longer than the exerted part of the long-exserted pistil. Filaments short, purplish. Anthers pale orange-yellow (III) drying pinkish. Pollen pale yellow.

<sup>5/</sup> See footnote under barbadense x schottii.

Gossypium, Interspecies Hybrids, F<sub>1</sub>  
Rubidoux Laboratory, Riverside, July-September, 1934

harknessii x armourianum

W 41 (2 plants). No flower buds have appeared to date (Sept. 8). Much like harknessii in general appearance but plant more open and with more ascending branches than either parent. Obscurely puberulent on the very young parts, soon glabrous. Twigs more highly colored than in either parent, light mahogany colored, older bark light brown. Leaf blades grayish green (yellowish in harknessii, deeper green in armourianum), less shiny above than in armourianum, nearer harknessii in size and shape, entire to very shallowly 3-lobed with rounded lobes (similarly but less deeply than in harknessii), broadly ovate, obtuse or acutish, rather deeply cordate.

herbaceum x neglectum F

Photo by Peebles at Riverside in 1936, #172.

W 48 (3 plants). Plants large for Asiatics (heterosis effect?). Bark coffee-colored, that of the older stems nearly black, twigs, petioles and peduncles hirsute, the petioles more so than in herbaceum, less so than in neglectum. Leaf blades much nearer neglectum in shape. Involucel brown, resembling that of neglectum in its more triangular bractlets with slenderer, more setose teeth, the bractlets connate near base. Calyx more like that of herbaceum in its relatively inconspicuous oil glands and undulate or very short-dentate margin, the teeth deltoid and not *nectaries large, inverted delta-shaped, pubescent, perhaps non-functional.* (as in neglectum) setose-tipped. Petals approaching neglectum in size and shape (longer and narrower than in herbaceum) and in the much larger size of the very intense and solid spot, colored as in both parents, between Martius<sup>u</sup> yellow and picric yellow (IV), the spot between carmine and ox-blood red (I). Anthers light cadmium (IV). Bolls mostly 4-lock, short-ovoid, very plump, abruptly pointed, somewhat pitted, with long, deep apical furrows, red where exposed.

The backcross (W125) of this F<sub>1</sub> with herbaceum was photographed by Paul Peck at Riverside in 1936, #162.

Gossypium, Interspecies Hybrids, F<sub>1</sub>  
Rubidoux Laboratory, Riverside, July-September, 1934

*Photo by Peebles (W 43) in 1936, # 14-1*  
hirsutum x armourianum F<sub>1</sub>  
W 34 (3 plants) and W 43 (3 plants). Plants glabrous except on the very young parts, large, woody, many-stemmed but open, the branches wide spreading, with long internodes, the branchlets conspicuously zigzag. Bark of twigs reddish-brown, of older branches light brown. Leaf blades light green with a small brown pulvinus, mostly shallowly 3-lobed. Petioles about equalling the blades. Involucrel persistent after anthesis, the bractlets separate and with few long teeth. Calyx as in contextum x armourianum or with shorter teeth. Petals pale green yellow (V) or Martius<sup>u</sup> yellow (IV), reddish on the exposed edges, with or without spots that are faint and striate to rather intensely pomegranate-purple (XII). <sup>6/</sup> Filaments colorless or the lowest purple. Anthers with or without red color on the connective. Pollen light cadmium (IV). Exserted portion of the pistil very long (armourianum character).

Very similar in all characters to contextum x armourianum (W 56).

hirsutum x barbadense (Pima)

W 50 (2 plants). Typical of the combination in F<sub>1</sub>. Flowers and bolls very large. Petals near Martius<sup>u</sup> yellow (IV), with rather faint, striate spots. Pollen empire yellow (IV).

hirsutum x barbadense ? (Brown Mohaux 204A)

W 25 (2 plants). Plant A has pale green-yellow (V) petals with very faint or no spots, empire yellow (IV) pollen, long, pointed bolls and brown lint. Plant 1 has white lint, consequently either the ♂ parent was heterozygous for lint color or plant 1 was really from a cross with CB 204 B (White Mohaux).

<sup>6/</sup> The armourianum parent of W34 and W 43 was presumably heterozygous for this character.

Gossypium, Interspecies Hybrids, F<sub>1</sub>  
Rubidoux Laboratory, Riverside, July-September, 1934

hirsutum (Acala) x punctatum F<sub>1</sub>

W 47 (3 plants). Plants hirsutum-like in all characters, sparsely hirsute on the young stems and petioles. Petals very pale yellow, anthers pale yellow as in punctatum. Bolls 4-5 lock, large and plump, short-pointed or nearly pointless, with or without very short apical furrows.

Gossypium, Interspecies Hybrids, F<sub>1</sub>  
 Rubidoux Laboratory, Riverside, July-September, 1934

sturtii x armourianum F<sub>1</sub>

W 40 (1 plant). No open flowers have been produced to date (Sept. 8).  
 Plant minutely puberulent on the very young parts, soon glabrous, low, about 3½ feet high, compact, with very numerous, ascending branches, much lower and more spreading than sturtii but with fewer and less spreading branches than armourianum. Twigs and petioles partly reddish (more so in armourianum, green in sturtii), glaucous. Leaf blades not glaucous and of about the same color as in armourianum but thinner and less shiny above, much larger than in armourianum, broadly ovate, subcordate, abruptly short-acuminate with a cartilaginous tip (this more pronounced in sturtii), usually with a small slit-like nectary near the base of the midvein. Involucel of intermediate size and character, more persistent than in armourianum, the bractlets widely separate, narrowly lanceolate, entire, or occasionally with a minute tooth near apex, very sharply cartilaginous-acuminate. Calyx conspicuously dentate with deltoid-subulate teeth, these longer and slenderer than in armourianum, and with numerous, conspicuous and prominent black oil glands.

Flowers were examined at Palm Springs April 7, 1938, and showed:

Bracts <sup>2-3 bractlets</sup> 15 <sup>16</sup> mm. long, <sup>6-8 mm. wide</sup> ovate-lanceolate, short-acuminate, entire, persistent; nectaries at summit of peduncle 2 or 3, variable in size; calyx <sup>(without nectaries)</sup> 10 mm. high, sharply 5-dentate, with <sup>(with 2 or 3 angular-lanceolate)</sup> numerous black oil-glands; petals 4 cm. long, <sup>(moderately crumpled on upper margins)</sup> pinkish buff, rose-colored outside where exposed in bud, with large, <sup>(nearest)</sup> Sturtii-like, <sup>(palest)</sup> purple spots; <sup>(solid, except the feathered margins)</sup> column 17 to 18 <sup>22</sup> mm. long, antheriferous 2/3 or more of its length; stamens very numerous; anthers pale

20 to 2.5 mm. long, the 2 or 3 seeds  
 portion elongate, white, smooth (pink at apex)  
 black oil-glands

Gossypium, Interspecies Hybrids, F<sub>1</sub>  
Rubidoux Laboratory, Riverside, July-September, 1934

sanguineum x <sup>africanum</sup>  
obtusifolium F<sub>1</sub>

W 45 (3 plants). Young stems, petioles and peduncles very hirsute. Bark dark brown when young, becoming nearly black. Leaf blade more like that of sanguineum (CB 787) than herbaceum, deeply lobed, with relatively narrow, acuminate lobes; but the lobes are broader than in sanguineum and are more or less contracted at base (herbaceum character). The hybrid has a very small nectary on the midvein towards base, a character not noted in sanguineum nor in obtusifolium CB 749 but present in obtusifolium CB 419, the ♂ parent of this hybrid. Involucel like that of sanguineum in having bractlets of more triangular shape but they are rather deeply lacinate with setose-tipped teeth as in obtusifolium, while in sanguineum they are merely denticulate. Calyx resembling both parents in <sup>having margin merely with</sup> undulate or very short and broad teeth; <sup>nectaries large, functional.</sup> Involucel and calyx both showing a diluted condition of the reddish color conspicuous in sanguineum but lacking in obtusifolium. Petals ruffled on the outer edge, nearly as large as in obtusifolium (much larger than in sanguineum) approaching the latter in their prevailing color, which is pomegranate-purple (XII) (yellow in obtusifolium) but shading to yellowish around the spot rather than, as in sanguineum, to whitish. Spot solid and intense, Bordeaux color (XII) intermediate in size relative to that of the whole petal (relatively much larger in sanguineum). Column much as in sanguineum (more elongated than in obtusifolium). Anthers near xanthine-orange (III) as in obtusifolium (purplish in sanguineum). Bolls mostly 3-lock, oblong-ovoid, short-pointed, smooth, reddish where exposed.

The characters of both parents are about equally represented in the hybrid.

The F<sub>1</sub> of the backcross of this F<sub>1</sub> with sanguineum, was photographed by  
C. G. W. & M. H. 1934. No. 11. The corresponding backcross with africanum  
# 159.  
Digitized by the Hunt Institute for Botanical Documentation  
Sanguineum x africanum F<sub>1</sub>

Gossypium, Interspecies Hybrids, F<sub>1</sub>  
Rubidoux Laboratory, Riverside, July-September, 1934

Photo by Peebles sturtii x harknessii F<sub>1</sub>  
(W 35) in 1936, # 142

W 35 (3 plants), W 39 (3 plants) and W 52 (2 plants). Plants all very similar, of intermediate habit, less stiff and erect than sturtii<sup>7/</sup> but much less spreading than harknessii, more open than either parent, <sup>8/</sup> with numerous erect or ascending branches, nearly glabrous. Twigs reddish brown, glaucous, older bark pale brown. Petioles obscurely puberulent towards apex. Leaf blades glaucescent, nearer harknessii in color, broadly deltoid, entire to rather deeply 3-lobed (much more so than in harknessii), subcordate, acuminate, the lateral lobes rounded or acute, with a very small, slit-like nectary near the base of the midvein. Stipules conspicuously clustered at the ends of the branches, as in sturtii. Involucel more persistent than in harknessii, larger than in either parent, 1/2-3/4 as high as the corolla, glabrous, the bractlets widely separate, <sup>25 mm. long,</sup> ovate or lance-ovate, setose-acuminate, narrowed at base, usually undulate or sparsely denticulate on the margin/ but sometimes dentate with very few, short or long, subulate-setose teeth, usually 1 or 2 of them <sup>bractlets</sup> with a nectary at base. Calyx very thin, obscurely ciliolate, dentate with short, deltoid, very acute teeth and with numerous oil glands. Petals 1-2 inches long, of a rather dingy color between rose pink (XII) and hellebore red (XXXVIII), with a broad, pinkish buff stripe on the exposed edge, the spot large, much like that of sturtii in shape but less feathered, bright carmine (I). Column often very long, as in sturtii. Filaments much shorter than in harknessii. Anthers between dragon-blood red (XIII) and Etruscan red (XXVII), the connectives usually without oil glands. Pollen pale yellow. Pistil (exserted portion) long but usually shorter than the column.

<sup>7/</sup> W 35 plant A more nearly resembles sturtii in habit than the other plants.

<sup>8/</sup> Much more open and fewer-branched than sturtii or armourianum (W 40).

Gossypium, Interspecies Hybrids, F<sub>1</sub>  
Rubidoux Laboratory, Riverside, July-September, 1934  
Photo by Peebles at Riverside in 1936, #168  
Thurberia theophrastoides x G. sturtii F<sub>1</sub>

W 58 (2 plants). Plants tall (one 10 feet high), much more open in habit than sturtii, with numerous, nearly erect limbs, some of which are borne high on the plant, the young branches somewhat glaucous. Stipules long, subulate, clustered at the ends of the branches. Leaf blades green, slightly glaucous, much like those of Thurberia in shape, ovate-lanceolate and entire to deeply and narrowly 3-lobed, the lobes long-acuminate, <sup>9/</sup> <sub>10/</sub> setose at apex as in sturtii (but not in Thurberia), with an elongate, slit-like nectary very near the base of the midvein. <sup>11/</sup> Involucel with bractlets widely separate, as in both parents, bractlets lanceolate, intermediate in width but near sturtii in length, setose-tipped (as in sturtii) often with 1 or 2 setose teeth, <sup>12/</sup> usually with nectarial <sup>a large and conspicuous</sup> at the base of <sup>each</sup> all 3 bractlets (as in Thurberia, but not in sturtii). Calyx abruptly dentate with <sup>nectaries gone.</sup> subulate-setose teeth, <sup>13/</sup> very asymmetrical. Petals approaching those of sturtii in size and shape, <sup>fading to the latter color,</sup> in color intermediate between white and pale amaranth pink (XII), the spot between pomegranate-purple and Bordeaux (XII), very like that of sturtii but occupying <sup>a larger proportion</sup> somewhat more of the area of the petal. Column much as in sturtii, elongate, with short filaments but with fewer stamens and these not extending so near the base of the column. <sup>14/</sup> Filaments purple. Anthers daphne pink (XXXVIII). <sup>15/</sup> Pistil (exserted portion) long but not equalling the column. <sup>16/</sup>

<sup>9/</sup> In Thurberia sometimes 5-lobed.

<sup>10/</sup> Abruptly apiculate in sturtii.

<sup>11/</sup> In Thurberia the nectary is broader and lanceolate, while in sturtii, when present, it is similar to that of the hybrid.

<sup>12/</sup> Such teeth are occasional in Thurberia, although not in our specimens. In sturtii the bractlets are (always?) entire.

<sup>13/</sup> In sturtii the teeth are shorter and broader, in Thurberia the calyx margin is obscurely dentate with broad, obtuse teeth.

<sup>14/</sup> In Thurberia the column is much shorter and the filaments are much longer.

<sup>15/</sup> In Thurberia the anthers are cream-color and filaments pale yellow.

<sup>16/</sup> In Thurberia the pistil is little exserted.

purpurascens x tomentosum  $F_1$

(Riverside, Calif., Sept. 6, 1935)

W 95 (3 plants). About 6 feet high, erect, with numerous ascending vegetative branches high on axis, densely pubescent with very short hairs on young stems, petioles and leaf-blades. Bark dark purplish-brown as are the petioles, pulvinus and leaf-veins. Stipules lanceolate, about 15 mm. long. Leaf-blades rather conspicuously dark-punctate, deeply 5-lobed with lance-ovate, acuminate lobes that are somewhat overlapping at base, the midlobe about twice as long as the undivided portion, one or more of the lobes, especially the basal ones, occasionally with a coarse tooth, with a small, more or less triangular nectary near the base of the midvein.

Has produced no flower buds to date. Resembles the purpurascens parent in nearly all characters except that the latter is glabrescent (pubescent only on the very young parts) and the bark appears darker-colored and shinier.

purpurascens x tomentosum, F<sub>1</sub>

(Riverside, July 13 and September 17, 1936)

W 95. Plant tall, with numerous, suberect branches. Bark nearly black. Leaves (especially the pulvinus and veins) and involucels more or less purple (color less intense than in purpurascens). Leaves and young stems soft-pubescent (less so than in tomentosum). Leaf blades deeply 5-lobed, with oblong-ovate, acuminate lobes, deeply cordate at base with a narrow basal sinus, copiously black-punctate; nectary (usually present) near base of the midvein only, small and often ill-defined, sometimes slightly elongate. Bractlets long and narrow, slightly connate, oblong-ovate, with few, long, lance-subulate, setaceous-acuminate teeth; a well-defined nectary at base of 2 or all 3 bractlets. Calyx margin entire or undulate; oil glands numerous, black. Corolla clear yellow (lighter than in tomentosum and not glossy), spotless. Stamens with long filaments. Pollen yellow, of very nearly the same color as the petals. Stigmas very long, equalling or longer than the column, with numerous black oil glands. Bolls 3- or 4-lobed, slender, short-acuminate (not sharply so) or sharply long-acuminate, the surface pitted. Seeds densely covered with long brown fuzz. Lint short but fine, brownish.

sanguineum x anomalum, F<sub>1</sub>

(Riverside, September 17, 1936)

Photo by Peebles # 129

W 27 (1 plant). Plant tall, open, with ascending branches. Young bark nearly black, old bark brown. Branches and petioles hirsute. Leaf blades glabrate above, rather long-stellate pilose on the margins and lower surface, with many long, simple, flaccid hairs on the principal veins beneath and on the petioles, a few on the margins, very deeply 5-lobed with narrow, acuminate lobes; basal sinus shallow and open; pulvinus dull brown; nectary at base of midlobe only, very small. Bractlets separate and distant, ovate-oblong, truncate, 3-cleft very deeply (to the middle or lower), with lanceolate, setaceous-acuminate teeth; occasionally with 1 or 2 very short additional teeth; nectaries at base of 2 or all 3 of the bractlets. Calyx strongly nerved (anomalum character), 5-dentate with rather long deltoid-subulate teeth; nectaries none; oil glands few. Corolla about 35 <sup>mm</sup> cm. long, considerably surpassing the involucl; petals deep rose shading to whitish just above the large, very dark red (nearly black) spots. Column rather long. Pollen orange. Stigmas considerably exerted. Bolls 4-lock, slender, <sup>pronouncedly</sup> 4-angled, sharply long-acuminate, 30-35 mm. long, rather deeply few-pitted (not verrucose as in anomalum).

Resembles in vegetative characters the sanguineum parent, but as compared with the latter, the leaves are much more deeply lobed, with more acuminate lobes, and are much less highly colored, the hybrid being intermediate in this last character. The hybrid also has a very different involucl, that of sanguineum being dark brown-purple with strongly connate, broad, subcordate-deltoid, acute bractlets which are entire or very shallowly few-toothed near the apex.

sanguineum x Stocksii, F<sub>1</sub>

(Riverside, July 13 and September 17, 1936)

Photo by Peckles # 131.

W 99 (2 plants). Old bark light-brown or <sup>light gray</sup> (nearly white), young bark <sup>shades</sup> (not rigid as in sanguineum)  
nearly black. Branches numerous, wide-spreading or somewhat drooping.  
Twigs, petioles and leaf-blades pilose with short, stellate hairs. Leaves  
on the main stem and lower branches 2 to 4 times as large as the upper leaves,  
the latter only 25 to 35 mm. long and wide. Leaf blades broader and with  
more spreading and broader lobes than in sanguineum, the lobes often 1-cleft,  
less often several-cleft; nectary near base of midlobe, very small. Involucels  
purplish brown, the bractlets separate, cordate-ovate, rather deeply toothed  
on nearly the whole margin, the teeth 10 to 12, lance-subulate, setaceous-  
<sup>(very different from those of sanguineum)</sup> acuminate; a nectary at base of each bractlet. Calyx shallowly dentate with  
deltoid, acute teeth; nectaries none; oil-glands very few. Corolla (30 to  
<sup>(in July)</sup> 35 mm. long in September) about 1½ times as long as the involucl, campanulate-  
funnelform, deep rose with fairly large and intense, pomegranate-purple spots.  
Stamens numerous, with purplish-margined connectives. Pollen deep cream.  
Stigmas short but exerted.

Differs from sanguineum in the less rigid branches, broader leaf-blades  
with broader and more spreading lobes, and very different involucels (see  
description of latter under sanguineum x anomalum, F<sub>1</sub>).

*Thurberi*  
hirsutum x thespesioides (~~Thurberia~~), F<sub>1</sub>

(Riverside, September 16, 1936)

Photo by Peebles #136

W 44 (1 plant). Stem stout, erect with numerous, ascending or nearly horizontal branches. Bark (young and old) reddish brown. Plant obscurely and sparsely stellate-puberulent, at least on the young parts. Leaf blades large, thickish, firm, dark green (much as in barbadense), the larger ones deeply 5-lobed, with oblong-ovate, long-acuminate lobes, rather deeply cordate with a nearly closed basal sinus; nectary near or considerably above base of midvein only, large, deltoid; pulvinus dull brown. Bractlets separate, cordate-ovate, deeply cleft (to below middle), with numerous lanceolate, setaceous-acuminate teeth; a large, often dark-colored nectary at base of each bractlet. Calyx shallowly crenate with broadly deltoid, obtuse teeth; nectaries none. Corolla about 35 mm. long, much surpassing the involucl, open-campanulate; petals nearly white, fading pink, spotless. <sup>1/</sup> Filaments rather long. Pollen pale orange. Stigmas well-exserted, with black oil-glands.

---

<sup>1/</sup> The thespesioides parent individual had spotless petals.

herbaceum x cernuum, F<sub>1</sub>

(Riverside, September 17, 1936)

W 3 (1 plant). Stem erect, rather slender, with spreading or somewhat drooping branches. Young bark nearly black, old bark light brown. Young branches and petioles densely short-stellate-pubescent, with fewer long, spreading, simple hairs. Leaf-blades short-stellate on both faces, with long, spreading, simple hairs on the principal veins beneath, deeply 5-lobed with ovate or oblong-ovate, acuminate lobes, these occasionally rather deeply 1-cleft: more like those of the cernuum parent, but broader, more spreading and more deeply lobed; pulvinus brown; nectary very small, about 1/2 way between base of midlobe and base of blade. Pedicels ascending before anthesis, declined in fruit. Bractlets broadly ovate and deeply cordate, strongly connate, shallowly toothed nearly to the base, the teeth much more numerous and much longer than in cernuum, more like those of herbaceum. Calyx margin merely undulate; nectaries at base, between the bractlets. Corolla about 30 mm. long, not much surpassing the involucrel; petals pale yellow with very large, pomegranate-purple spots. Pollen pale orange. Stigmas barely exerted. Bolls of intermediate character, 4-lobed, quadrangular-ovoid, rather abruptly short-acuminate, nearly as smooth as in herbaceum (deeply many-pitted and more tapering in cernuum).

*Thurberia*  
Armourianum x thespesioides (Thurberia) F<sub>1</sub>

(Riverside, September 17, 1936)

Photo by Peebles (W9) # 135.

W 8 and 9 (1 plant of each). Plant much more open than Armourianum, the numerous branches much longer and more spreading. Old bark gray-brown, that of twigs purplish green or purplish gray. Plant glabrous except for some puberulence on the very young parts. Leaves grayish green (very different from the grass-green of Armourianum). Leaves deeply 3-lobed, the lobes broadly lanceolate or ovate-lanceolate, occasionally 1-cleft, acuminate but obtusish and mucronate at apex, shallowly cordate with a very narrow basal sinus; pulvinus very small, brownish; nectary near base of midvein only, small, round, deltoid, or somewhat elongate. Bractlets entire, lanceolate, acuminate, deciduous in a very early stage of the flower-bud, and about as long as or somewhat longer than the calyx at that stage; a rather large nectary at base of 2 or all 3 bractlets. Calyx abruptly 5-dentate, teeth deltoid, acute; nectaries none; oil glands numerous, very small, greenish. Corolla about 25 mm. long, open-campanulate (Thurberia-shaped); petals ochroleucous (decidedly yellower than in Thurberia), yellower towards base, pinkish where exposed in bud, spotless in all flowers on one plant (W8), very faintly spotted (grade 1 or 2) in some flowers of W9. Filaments rather long, purplish towards apex as are the connectives. Pollen pale orange on one plant, cream on the other. Stigmas long (about 10 mm.), dotted with reddish brown oil glands. Bolls mostly 3-lobed, about 15 mm. long and nearly as wide, rounded-ovoid, nearly mucicous, olive-green; oil glands numerous but surface not pitted.

---

<sup>1/</sup> The Armourianum parent had spotless petals, the thespesioides parent of W8 had spotless petals, that of W9 had faintly spotted petals.

*Thurberii*  
Nanking x thespesioides, F<sub>1</sub>

(Riverside, July 13, September 17, 1936)

Photo by Peebles # 130

W 79. Stem tall, with the larger branches ascending. Plant glabrous except on the young parts, which are somewhat puberulent. Bark brown, nearly black on young twigs. Leaf blades deeply and narrowly 3- to 5-lobed, with oblong-lanceolate, acuminate lobes, with a shallow, open basal sinus; pulvinus and principal veins light brown; nectary near base of midlobe, only, very small. Involucel small, barely 2 cm. long, the bractlets separate to the base or united very near the base, somewhat truncate at apex, cordate-ovate, rather deeply 5-toothed but not cleft to the middle; nectaries at base of all 3 bractlets. Calyx with undulate margin, numerous, but inconspicuous, oil-glands, and no nectaries. Corolla about twice as long as the involucel, rotate-campanulate (*more funnel form in later flowers*) (Thurberia-like), nearly white (pink where exposed in bud), with well-developed spots (grade 7)<sup>1/</sup>; petals shallowly erose. Pollen orange (cadmium?). Stigmas short but exserted.

---

<sup>1/</sup> The *Thurberii* thespesioides parent was a spotless individual.

Harknessii x Armourianum, F<sub>1</sub>

(Riverside, September 17, 1936)

W 41 (1 plant). The plant characters were noted in 1934. Leaf blades with a very small, deltoid nectary near the base of the midvein. Involucel caducous when the bud is about 8 mm. long, hence somewhat more persistent than in Armourianum but much less so than in Harknessii, the bractlets lanceolate or ovate-lanceolate, about 12 mm. long and 4 to 5 mm. wide, acuminate, entire or very shallowly 1-2-dentate; a large inverted delta-shaped nectary at the base of each bractlet, externally. Calyx very shallowly 5-dentate with broadly deltoid, acute teeth; nectaries none. Corolla about 35 mm. long, very broadly campanulate. Petals pale yellow, reddish where exposed in the bud, with small but intense spots (grades 6 to 8), shallowly erose and crispate on the margin. Column rather short. Filaments ascending, these and the connectives tinged with pink. Pollen orange. Stigmas long-exserted, longer than the column, copiously dotted with red-brown oil-glands. Bolls about 1 cm. long and wide, not narrowed at apex, slightly depressed, mucous, surface smooth but oil glands very numerous and conspicuous. Seeds covered with closely appressed, matted, curly, grayish brown hairs.

Capsule, before opening, 15 mm. high, rounded-quadangular, about equally wide at base and apex, truncate, mucous, depressed in the center, pale green, very copiously dotted with slightly prominent, brown oil-glands, 4-lobed, the margins of the lobes copiously long-ciliate internally. Seeds 1 to 3 per locule, often strongly coherent, 8 to 9 mm. long, rounded, convex dorsally, flattened on the inner faces, striate, densely covered with light-brown, crispate, very closely

hirsutum (Red Acala) x Sturtii F<sub>1</sub>.

(Riverside, September 17, 1936)

Photo by Peebles # 139.

W 81 (3 plants). Plant open, with numerous nearly horizontal or somewhat drooping fruiting branches. Bark brown-purple, glaucous. Plant sparsely to rather copiously stellate-puberulent. Leaves dark green, usually heavily mottled with dark red, the blades entire or very shallowly 2-3-lobed, broadly ovate (or nearly quadrangular when lobed), shallowly cordate, short-acuminate and cuspidate; nectary near base of midvein only, very small but sharply defined, narrowly deltoid; pulvinus red-brown. Involucel red-brown, the bractlets distinct, ovate, subcordate, rather shallowly several-toothed, the teeth lance-subulate, setaceous-tipped; a small nectary at base of each bractlet, often deeply colored or black. Calyx shallowly dentate with short, subulate, almost acicular teeth; oil-glands fairly numerous. Corolla about twice as long as the involucel, broadly campanulate; petals deep rose-red with large dark-red, Sturtii-like spots. Column elongate. Filaments and connectives purple. Pollen cream. Stigmas well-exserted, with few oil-glands.

hirsutum x Sturtii, F<sub>1</sub>

(Riverside, September 17, 1936)

Photo by Peebles, # 140.

W 82 (3 plants). Resembles hirsutum (Red Acala) x Sturtii (W 81) but bark greenish, foliage dark green (sometimes purplish on veins, pulvinus and margins), involucels green or tinged with purple, calyx teeth longer. Two plants have nearly spotless petals and the third has petals with large spots. The filaments, but not the connectives, are purplish in one of these plants.

W 139 (1 plant) is similar to W 82. It has large, Sturtii-like petal spots and cuspidate leaf-lobes.

Armourianum x ?

(Riverside, Sept. 17, 1936)

Photo by Peebles # 138

W 101 (2 plants). Intricately branched, with divergent branches.

Young bark light brown, old bark brownish gray. Plant glabrous except the very young parts, which are puberulent. Leaf blades small (not more than about 5 cm. long), appearing diseased, more or less cuneate at base, deeply and narrowly 3-lobed, the lobes lanceolate, ascending at a narrow angle; a nectary on midvein only, about 1/2 way to base of midlobe, relatively large, deltoid. Bractlets separate, distant, oblong, deeply 5-7-toothed towards apex with lance-subulate, setaceous-tipped teeth; a large nectary at base of each bractlet. Calyx with merely undulate margin, no nectaries, and numerous oil-glands. Corolla about 40 mm. long, more than twice as long as the involucrel, funnelform, pale yellow, fading pinkish, faintly spotted (grade 2 to 3+). Stamens numerous, with ascending filaments, these and the connectives purplish. Pollen orange. Stigmas long-exserted, nearly equalling the column, with black oil-glands.

herbaceum x Sturtii, F<sub>1</sub>

(Riverside, Sept. 17, 1936)

Photo by Peebles #132

W 111 (5 plants). Plant very like Sturtii in habit and appearance but more open, the branches fewer and more spreading, and the foliage darker-colored and less glaucous. Twigs, petioles, pulvinus, and often the leaf-blades purplish (sanguineum character), somewhat glaucous. Plant glabrous except the very young parts. Leaf blades entire or shallowly 2-3-lobed, broadly ovate, subcordate, with a very small basal sinus, acutish and short-cuspidate; nectary near base of midvein only, very small but well-defined. Bractlets separate, 20 to 25 mm. long and about 1/2 as wide, ovate, short-acuminate, shallowly dentate near the apex with 2 to several subulate lateral teeth; a nectary at base of each bractlet. Calyx rather deeply 5-dentate (but cleft not nearly to the middle), the teeth deltoid, acuminate; nectaries none; oil glands few. Corolla about 3 times as long as the involucl, the petals deep rose-color, with large, dark red, Sturtii-like spots. Column rather long. Filaments rather short, rose-red; connectives purple. Pollen deep cream. Stigmas rather short, but well-exserted.

hirsutum x cernuum, F<sub>1</sub>

(Riverside, September 18, 1936)

Photo by Peckles #148

W 21. Stem stout, fruiting branches numerous, nearly horizontal.

Bark dark brown, becoming nearly black. Branches and petioles rather densely hirsute. Leaf-blades deeply 5-lobed, with oblong-ovate, acuminate lobes, deeply cordate at base with a narrow but open basal sinus, firm, dark-green with red-brown veins and pulvinus, copiously short-pilose on both faces with stellate hairs; a small but sharply defined nectary on the midvein about 1/2 way to base of the midlobe, and smaller ones near base of 1 or both principal lateral veins. Bractlets dark reddish brown, broad, cordate-ovate, strongly connate, deeply and coarsely dentate with numerous, deltoid-lanceolate, setaceous-acuminate teeth; an external nectary at the base of each bractlet. Calyx 5-dentate, with broad-deltoid, acutish teeth; nectaries small but sharply defined; oil-glands rather numerous. Corolla funnelform, not greatly surpassing the large involucrel, tinged with pink especially where exposed in bud and fading to rose-pink, with fairly large and intense (grade 7) pomegranate-purple spots. Column elongate. Filaments ascending, purplish. Pollen orange-yellow. Stigmas well-exserted but much shorter than the column.

barbadense x tomentosum, F<sub>1</sub>

(Riverside, September 18, 1936)

Photo by Peebles # 149

W 28 (3 plants). Stem tall, erect, stout, with few, ascending vegetative branches and spreading fruiting branches. Bark green and red. Young leaf-blades and petioles grayish tomentose with very short hairs (as in tomentosum), the pubescence becoming much sparser with age and the leaf blades becoming much darker green than in tomentosum. Leaf blades large, nearly quadrangular in outline, deeply 5-lobed with oblong-ovate, acuminate lobes, deeply cordate with a closed basal sinus, deep green when older; pulvinus dull brown; nectaries small and indistinct at base of the midvein and (or) one of the principal lateral veins, seldom on all 3 veins, apparently sometimes none. Bractlets separate or very nearly so, broadly ovate, deeply cordate, rather shallowly dentate with numerous, lance-subulate, setaceous-tipped teeth; nectaries usually present at base of all 3 bractlets. Calyx margin entire, oil-glands numerous; nectaries present, hairy. Corolla open-campanulate; petals bright yellow (deeper yellow than in barbadense) with well-developed spots (grade 6 or 7). Column long, with numerous stamens. Pollen orange-yellow. Stigmas long, with few black oil-glands.

hirsutum x tomentosum, F<sub>1</sub>

(Riverside, September 18, 1936)

Photo by Peabody # 147

W 29. Stem erect, very stout, with ascending limbs and spreading fruiting branches. Whole plant whitish tomentose, the hairs short but longer than in tomentosum. Bark green tinged with reddish brown. Leaf blades nearly quadrangular in outline, deeply cordate with a very narrow or closed basal sinus, rather deeply 5-lobed with ovate, acuminate lobes, these often undulate or slightly toothed; pulvinus dull brown; nectary near base of the midvein only, very small for so large a leaf. Bractlets broadly ovate, deeply cordate, slightly connate, deeply dentate with numerous, deltoid-lanceolate, setaceous-acuminate teeth; nectaries at base of 2 or all 3 bractlets, small but distinct. Calyx very shallowly crenate with broadly deltoid, obtuse or acutish teeth; oil glands much as in nectaries present, but perhaps non-functional.  
hirsutum; <sup>^</sup> Corolla not greatly surpassing to twice as long as the involucrel, campanulate; petals light yellow (paler than in tomentosum), spotless. Filaments rather long, white. Anthers and pollen pale yellow. Stigmas short but well-exserted.

(contextum x Hopi F<sub>1</sub>) x anomalum, F<sub>1</sub>

(Riverside, September 18, 1936)

W 55. Plant very open, with several limbs ascending at a wide angle, and long, nearly horizontal, fruiting branches. Bark light reddish brown. Stems and petioles rather densely hirsute. Leaf-blades dark green, densely stellate-tomentose, especially beneath, deeply 5-lobed, with broad-ovate, rather abruptly short-acuminate lobes, deeply cordate at base with a narrow but usually open basal sinus; pulvinus dull brown; a small but sharply defined nectary at base of the midvein and smaller ones on the principal lateral veins. Bractlets separate, oblong-ovate in outline, subcordate, with rather large, often colored nectaries, very deeply cleft, with few (usually 5), long, lanceolate, setaceous-acuminate teeth. Calyx 5-dentate with deltoid-subulate teeth of variable length, the veins prominent but much less so than in anomalum; oil-glands numerous. Corolla funnelform-campanulate, never widely expanded (anomalum character) about  $1\frac{1}{2}$  times as long as the involucrel; petals ochroleucous, tinged with pink where exposed in the bud, with relatively very large, pomegranate-purple spots (about grade 12). Filaments rather short, spreading. Pollen pale yellow. Stigmas well-exserted.

hirsutum (Red Acala?) x tomentosum, F<sub>1</sub>

(Riverside, September 18, 1936)

Photo by Peebles # 146,171

W 80 (3 plants). Densely tomentose with very short pubescence like that of tomentosum. Bark reddish brown to nearly black. Leaves darker green than in tomentosum and tinged with dark red, pulvinus and veins pinkish. Leaf blades rather shallowly 5-lobed, with broad, ovate, short-acuminate lobes, deeply cordate at base with a very narrow or closed basal sinus; a very small but sharply defined nectary near base of the midvein, only, sometimes wanting. Bractlets reddish, separate or nearly so, broadly ovate, deeply cordate, rather shallowly toothed on nearly the whole margin, with lance-deltoid, setaceous-acuminate teeth; a small but well-defined nectary at base of 2 or all 3 of the bractlets. Calyx with very shallowly crenate margin, the teeth broad, rounded or acutish; oil glands rather numerous, black; nectaries present, but perhaps non-functional. Corolla campanulate, not much surpassing the involucrel; petals pale yellow (much paler than in tomentosum), deeply tinged with red where exposed, slightly glossy, spotless. Column elongate. Filaments rather long. Anthers ochroleucous. Pollen cream. Stigmas well-exserted but much shorter than the column. Bolls 3-lock, narrow, tapering to a sharp point or abruptly short-acuminate, not pitted but with conspicuous, black oil glands.

(barbadense x Schottii, F<sub>1</sub>) x anomalum, F<sub>1</sub>

(Riverside, September 22, 1936)

Photo by Peebles # 174.

Wl. Stem tall, slender, erect, with very few branches, these ascending at a narrow angle. Bark dark purplish brown, nearly black. Very young twigs and petioles rather densely soft stellate-pilose, with a few long, flaccid, simple hairs. Leaf-blades stellate-pilose beneath, glabrate above, shallowly cordate with an open basal sinus, very deeply 5-lobed, the lobes oblong-lanceolate, sharply long-acuminate; veins purple, pulvinus nearly black; nectaries near base of the 3 principal veins, sharply defined, deltoid or rounded. Bractlets separate and rather distant, ovate, subcordate, cleft to below the middle with numerous long, lanceolate, setaceous-acuminate teeth; nectaries conspicuous at base of 2 or all 3 of the bractlets. Calyx moderately ribbed (much less prominently than in anomalum, scarcely more than in barbadense and hirsutum), 5-dentate, with teeth acute or one or more of them elongate and subulate from a deltoid base; oil glands numerous, very small. Corolla (late season) little surpassing the involucrel, funnelform (anomalum character); petals very pale yellow, fading pink, with very large, pomegranate-purple spots. Column elongate. Filaments short, white. Pollen golden-yellow, as in Pima. Stigmas well-exserted but short. Boll (very young) 4-lobed, sharply acuminate, the surface smooth but with the oil-glands apparent.

Davidsonii x Klotzschianum, F<sub>1</sub>

(Riverside, September 22, 1936)

Photo by Peebles # 145, 170

W 10 (3 plants). Main stem erect, with numerous, long, ascending or spreading limbs. Young bark reddish, older bark light brown. Young twigs, petioles, leaf blades and involucels velvety tomentose with very short hairs. Leaf blades ovate, truncate or slightly subcordate at base, sharply long-acuminate, entire or very shallowly 2-3-lobed; pulvinus small, brown; nectary near base of the midvein only, small but sharply defined. Bractlets separate, broadly ovate, deeply cordate, dentate on nearly the whole margin with lance-subulate, setaceous-acuminate teeth; nectaries small and inconspicuous. Calyx with entire or undulate margin, no nectaries, and numerous, but inconspicuous, greenish oil-glands. Corolla <sup>1/</sup> open-campanulate, about 40 mm. long; petals bright yellow (deeper yellow than in Davidsonii), crisped and slightly erose at summit, with strongly asymmetric, striate, Klotzschianum-like spots of grade 6+. Column rather short but stamens numerous. Filaments rather short, yellowish. Anthers pale orange. Pollen nearly colorless. Stigmas long-exserted, closely twisted, with pale green oil-glands.

---

<sup>1/</sup> Only one flower was available for examination.

1934  
1733

Harknessii x Armourianum F<sub>1</sub>

(Riverside, Calif., July-September, 1934)

W 41 (2 plants). No flower buds have appeared to date (Sept. 8). Much like Harknessii in general appearance but plant more open and with more ascending branches than either parent. Obscurely puberulent on the very young parts, soon glabrous. Twigs more highly colored than in either parent, light mahogany colored, older bark light brown. Leaf blades grayish green (yellowish in Harknessii, deeper green in Armourianum), less shiny above than in Armourianum, nearer Harknessii in size and shape, entire to very shallowly 3-lobed with rounded lobes (similarly but less deeply than in Harknessii), broadly ovate, obtuse or acutish, rather deeply cordate.

(Riverside, Calif., Aug. 26, 1935)

W 41. Plant fragrant like Armourianum, more like Harknessii than Armourianum in its relatively tall growth, in the color and rather dull surface of the leaves, larger size of the leaves and their tendency to trilobation, although they are less deeply lobed than in Harknessii, with relatively shorter midlobe. Involucrel more persistent and much larger than in Armourianum, bractlets lanceolate, entire (?) about 1 cm. long. Calyx conspicuously dentate with short, deltoid teeth, oil glands numerous. Corolla pale green-yellow (V) with conspicuous pomegranate-purple (XII) spots (about grade 8). <sup>1/</sup> Anthers orange with red-bordered connectives. <sup>2/</sup> Filaments tinged with purple. Pollen orange. Exserted portion of pistil longer than column, thickly and conspicuously dotted with reddish glands, the stigmas united to apex. Bolls rounded and depressed (as in G. Harknessii at Riverside) and of about the same size as in that species, the inner margins of the valves copiously long-ciliate (Harknessii character). Seeds with pale brown hairs (Armourianum character).

---

<sup>1/</sup> The plant of G. Harknessii at Riverside has spotless petals but the original description of the species gives them as spotted.

<sup>2/</sup> The adjacent plant of G. Harknessii shows very little, if any, red color on the connectives.

hirsutum x Sturtii F<sub>1</sub>

(Riverside, Calif., Aug. 26, 1935)

W 82. Four young plants, light green, sparsely pubescent on the young parts, stems glaucescent. Leaves nearly as wide as long, entire to shallowly 3-lobed, the midlobe up to 1/2 the length of the blade, deltoid, acuminate, Pulvinus rather large, brown. Bractlets deeply laciniate with few, lance-subulate teeth, separate or somewhat connate, ovate, 2.5 to 3.5 cm. long. Calyx deeply dentate with deltoid-subulate teeth. Corolla about 5 cm. long, nearest Tyrian pink (XII) with Sturtii-like spots, between pomegranate-purple and Bordeaux (XII) these often very faint in one of the plants. Column resembling that of Sturtii except for the much greater length of the purple filaments. Stigmas shorter than in Sturtii.

herbaceum x Sturtii F<sub>1</sub>

(Riverside, Calif., Aug. 26, 1935)

W 111. Plant with a well-developed axis and numerous, ascending vegetative branches along its length. Stems and leaves glabrous or very nearly so, slightly glaucous (much less so than in Sturtii). Leaves entire to 3-lobed, the midlobe broadly deltoid, 1/3 to 1/2 the length of the leaf. Pulvinus very small, light brown. Bractlets brownish, separate, about 15 mm. long, broadly ovate, rather deeply lacinate with several slender teeth. Calyx reddish, deeply dentate with subulate teeth; <sup>nectaries none.</sup> Corolla about 5 cm. long, petals nearest deep rose-pink (XII) with large Bordeaux (XIII) spots that are broader than in Sturtii but feathered at the edge as in that species. Column elongate, much as in Sturtii but the lower filaments longer. Filaments purple, anthers reddish-orange, connectives whitish. Exserted portion of pistil short.

In general, resembles Sturtii much more than herbaceum.

sanguineum x Stocksii  $F_1$

(Riverside, Calif., Aug. 28, 1935)

W 99. Plant erect, slender (about 4 feet high with terminal bud aborted) open, with several ascending vegetative branches high on the axis. Young stems, petioles and leaf-blades sparsely short-pubescent. Bark dark brown. Petioles longer than the blades, the latter about as wide as long, deeply 5-lobed with rounded, apiculate lobes that are widest near the middle, pulvinus brown, very small. Bractlets separate, ovate, cordate, deeply lacinate with numerous, fairly long, lance-subulate, setose-tipped teeth. Calyx short-dentate with deltoid-subulate teeth, and few oil glands, <sup>and no secretions</sup> -  
The sanguineum parent is hirsute, the leaf lobes are narrower, widest below the middle and more acuminate, the bractlets strongly connate with few and much shorter teeth.

W 119 (G. palmeri x Okra-leaf Acala) F<sub>2</sub>. All plants flowering at Riverside on Sept. 16, 1941, had a pale yellow corolla. Only 5 or 6 plants in an F<sub>2</sub> population of 45 had open bolls on this date, and these all had white lint.