



Microcages used in studying the life history of the two-spotted mite on the several cotton biotypes. Left to right: cage containing a mite covered with a paper to prevent escape; uncovered cage; cage removed to illustrate construction; and bottom support portion of cage.

Spider Mite-Resistant Cotton

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Greater resistance to spider mites is the goal of a breeding program underway with Acala cotton at the U. S. Cotton Research Station, Shafter. Differences in susceptibility to spider mites, previously observed between genetic cotton types, are being utilized in present efforts to develop a mite-resistant cotton. Spider mite infestations have increased steadily since 1945 and this group of pests (*Tetranychus* spp.) now ranks as a major problem for cotton growers in California.

A SCREENING STUDY was undertaken at the U. S. Cotton Research Station, Shafter, in 1959 to seek promising genetic types of cotton with resistance to spider mites, particularly the two-spotted mite, *T. telarius* (L.). More than 80 have been screened to date. These included commercial and wild selections from several areas of the world, representing

five species of *Gossypium*. Further selections were made in the testing program to determine the basis for resistance and to breed a resistant commercial variety.

SEVERITY OF SPIDER MITE INFESTATION AND COLONY TYPE FOR SELECTED BIOTYPES

Biotype	Infestation score				Colony type
	1959	1960	1961	1962	
Rowden	4.0	4.0	5.0	5.0	Compact
Delfos	..	..	5.0	5.0	Compact
Acala 4-42	3.0	3.5	4.5	4.5	Compact
Acala 4-42-77 gs.	..	..	..	4.5	Compact
AxTE 25 gs.	..	..	..	4.0	Compact
richmondii	1.0	2.0	3.0	3.5	Disperse
thurberi	1.0	2.0	2.0	2.5	Compact
Tanguis	2.0	2.5	2.0	2.0	Disperse
4-42 x Tanguis	..	..	..	2.5	Intermed.

0—No mites evident
 1—Few mites on some leaves, light damage
 2—Few mites on many leaves, light damage
 3—Mites moderately abundant on many leaves, moderate damage
 4—Mites abundant on many leaves, extensive damage
 5—Mites abundant on all leaves, severe damage, defoliation
 Biotypes with an infestation score of less than 5 demonstrate moderate resistance

Resistance, as indicated by mite abundance and severity of damage, was evaluated in replicated field plots by exposing the biotypes to severe spider mite infestations. Each replication was scored for spider mite abundance and damage using a numerical rating system from 0, meaning that no mites were evident, to 5, indicating severe damage and defoliation with mites abundant on all leaves.

The results of infestation evaluations on selected biotypes are summarized in the table. Several have been found highly susceptible to spider mites, as indicated by a high numerical score of 5. This group includes some commercial biotypes developed for the rainbelt area of the United States, such as Rowden and Delfos, and some close relatives of Acala 4-42 variety.

The most resistant cottons are wild biotypes and genetic crosses of these with Acala 4-42. In this group are wild cot-

tons, one from Arizona (*G. thurberi*) and two from Mexico (*G. hirsutum* var. *richmondii*), a commercial *barbadensi* from Peru (Tanguis), and a Tanguis-Acala 4-42 cross. While mites also attack these biotypes, damage has been light.

Acala 4-42, presently grown by California farmers, was found to be intermediate in its resistance to mites with average infestation scores ranging from 3.0 to 4.5. This indicates that the past breeding program at Shafter has been indirectly successful in developing and maintaining resistance to spider mites. Advanced lines in the current breeding program—developed to improve yield, quality and seed value for future Acala seed releases—were equally resistant.

Colonies formed by spider mites are different in appearance. Spider mites normally form a colony on the lower leaf surface, which is covered by a loose web. A few or many mites may feed within this colony in close association with one another. As the population increases, the colony spreads over the leaf to accommodate the increasing number of mites, and to provide them with fresh feeding areas.

In some of the more resistant biotypes (those showing a lower damage score), the mites spread over the leaf surface and do not form colonies. On other biotypes they may form a compact colony which fails to grow. These characteristic differences have been indicated in the table.

The biology of the two-spotted mite is being studied to determine differences in developmental life history and reproductive ability between mites on the more susceptible and those on the less susceptible biotypes. Special microcages illustrated, allow researchers to follow individual mites through an entire life cycle.

The genetic relationships of the resistance evident in Acala cottons are also being evaluated. A breeding program has been undertaken aimed at providing a genetic foundation on which greater resistance can be built in the future. California cotton farmers should not expect resistance in their cotton immediately since research of this type must progress slowly in order to preserve the other qualities for which their product is best known. Greatest savings for growers will come through reduced use of chemical control measures possible with resistant cotton varieties.

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MILO EQUAL TO BARLEY

for Full Supplementation of Beef Cattle on Irrigated Pastures

Full supplementation by free-choice feeding of either rolled or ground barley to cattle on irrigated pastures brought them to acceptable slaughter condition within a 120- to 150-day feeding period—as previously reported in California Agriculture. Additional trials conducted using the same pastures have shown that rolled milo is equally acceptable when full-fed with pasture.

SUPPLEMENTAL feeding of cattle grazing irrigated pasture has been practiced for many years. Although relatively good gains can be achieved when the only feed is high-quality pasture forages, it is well recognized that an additional source of energy is needed to produce a finished animal with a high dressing percentage and a high grading carcass—over a reasonable feeding period. Tests at Davis have shown that full feeding of either rolled or ground barley to cattle grazing an irrigated pasture will supply this extra energy. No differences were obtained between either form of barley full-fed to cattle grazing irrigated pastures. Similar results have also been obtained for cattle being fattened in drylot.

An additional trial was conducted using these same pastures (orchardgrass and Ladino clover mixture) with a comparison of rolled milo vs. rolled barley for pasture fattening of cattle, as summarized below:

PASTURE VS. DRYLOT FATTENING			
Ration	Rolled barley plus pasture	Rolled milo plus pasture	70% conc. drylot ration
No. of days on feed.....	150	150	144
No. of animals.....	6	6	7
Daily intake of concentrates, lb.	13.7	13.4	12.2 ¹
Initial wt., lb.	631	628	601
Av. daily gain, lb.	2.34	2.37	2.44
Dressing, %	60.9	61.1	62.1
Av. % carcass fat.....	23.1	22.9	21.8
Av. carcass grade.....	High good +	High good +	High good +
Av. 20% fat-corrected carcass, lb. ²	652	652	622

¹ Animals consumed 17.4 lb. per day total ration.
² Corrects carcass wt. to 1,297 kcal. per lb., 20% fat and 17.3% protein.

No differences were found between treatments. The pasture steers consumed slightly more grain than the drylot steers but had a slightly lower dressing per cent. The pastured animals had slightly higher fat content in their carcasses so when the carcass weights were corrected to a 20% fat basis, to give a more correct comparison between treatments, these differences were no longer evident. There was no difference in final carcass grade. At slaughter no sign of "yellow" fat in the carcasses was noted. It was concluded that either rolled or ground barley or rolled milo was acceptable when full-fed with pasture.

These results have been confirmed, using barley, in field trials in Madera, Lake and Shasta counties. One disadvantage noted in some field trials was the appearance of some lame cattle after 90 days on feed. Color of carcass fat was comparable for pasture or drylot fattened cattle.

Results obtained indicate that the following factors be considered: (1) a high-producing but palatable pasture containing a mixture of legumes and grasses is needed; (2) the usual stocking rate of the pasture can be doubled; (3) the desired grain can be fed free-choice and kept constantly available after a 3-week period in which the animals are brought on feed; (4) cattle should be rotated between fields within the pasture to keep the forage palatable and to facilitate irrigation; (5) control of internal parasites is necessary; and (6) since this is a high energy ration an increased daily gain can be expected with a 30 mg. implant of diethylstilbestrol.

Cattle can be expected to consume from 10 to 15 lb. of grain plus enough pasture to gain between 2.25 and 2.75 lb. daily and will reach acceptable slaughter condition in 120 to 150 days with this system. The limited length of most pasturing seasons means the starting weight of the cattle should be 700-750 lb. for finishing at 1000-1050 lb. live weight.

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