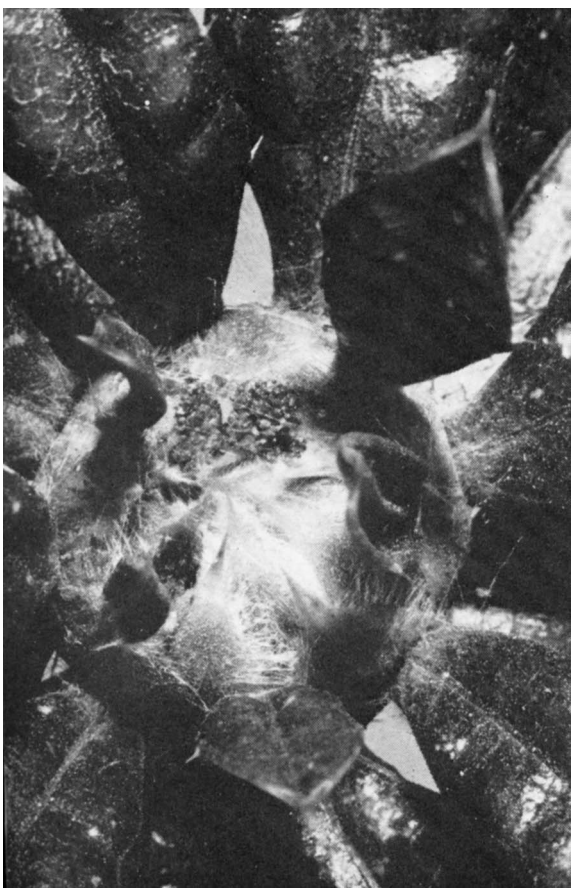
Safflower bud bronzed and about to be blasted due to flower thrips feeding.

Safflower head damage and frass due to the feeding of a sunflower moth larva on the seed (inside head).



PESTICIDES increase seed yields of late SAFFLOWER

ELMER C. CARLSON

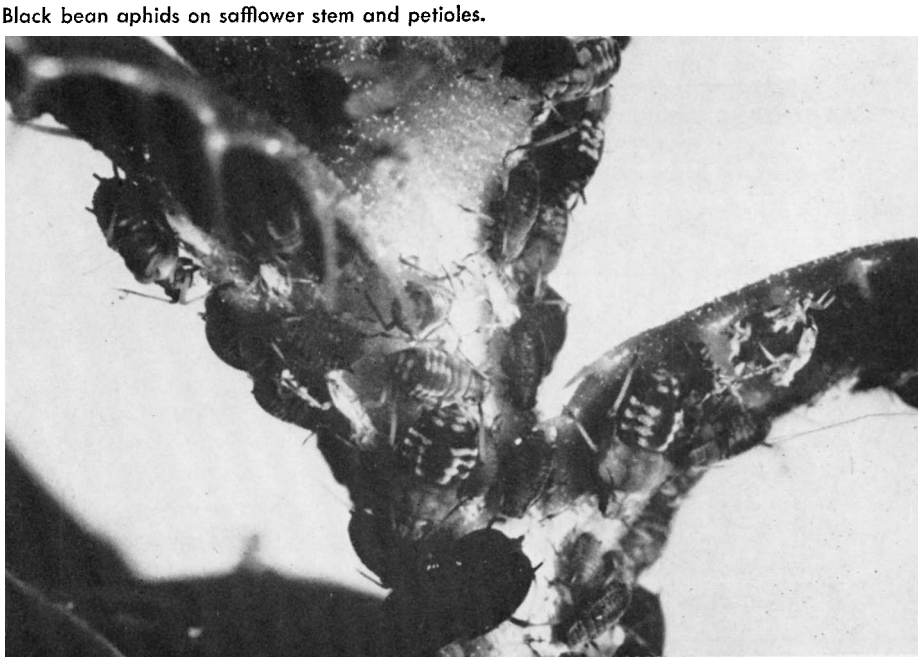
Pesticide applications have significantly increased safflower seed yields when treatments were made twice to late-planted, irrigated safflower. Severe bud damage and blasting often occurs because plant bloom and bud development is not underway until July or August, and the higher summer populations of lygus bugs and flower thrips feed on and injure the buds.

RECENT RESEARCH on safflower insects has been primarily concerned with insecticidal control, involving experiments designed to determine the effectiveness of several new chemicals in terms of dosage, timing, number of applications, and residues. The pests include flower thrips, *Frankliniella occidentalis* (Pergande), lygus bugs, *Lygus hesperus* Knight, sunflower moth, *Homoeosma electellum* (Hulst.), black bean aphid, *Aphis fabae* Scop., and spider mites, two spotted mite, *Tetranychus urticae* (Koch.).

The experiments were conducted on late-planted, irrigated safflower in both replicated small-study plots and aircraft plots. The major safflower pests for which this program was developed were flower thrips and lygus bugs. On late-planted safflower, midsummer populations of these insects reach damaging levels and thus provide the best opportunity to measure yield difference attributable to pesticidal control. Data on the performance of the compounds against black bean aphid, the sunflower moth, and spider mites were also obtained.

The performance and residue plots at

Black bean aphids on safflower stem and petioles.



Davis were treated at a rate of 18.9 gals per acre using an experimental CO_2 backpack sprayer with two Teejet 800067 flat fan nozzle tips per row. Lygus bug and predator population levels were determined by shaking five separate samples of buds and heads per replicate into a collecting jar and counting the live insects in a large enamel pan. Bud damage and blasting due to flower thrips was determined by checking a randomized 25-bud sample per replicate. Aphid and spider mite populations were estimated by counting the number of insects present per head bract in a random sample of 25 heads per replicate, and the number and severity of heads damaged per 25 was determined for the sunflower moth larvae. Seed yields were obtained by running an 11-foot combine through each 50-foot plot series.

Live insect counts were obtained in the aircraft plots by making 10 sweeps per plot in each of eight stations at several time intervals after spraying. An estimate of bud damage caused by thrips feeding on the upright bronzed and blasted buds was made from random samples of 25 buds taken at each of four stations per treatment. A 13-ft combine was run through three 50-ft-long areas per treatment to determine seed yields.

The pesticide control data for 1966 given in table 1 show that only the experimental material GS 13005 and endosulfan (Thiodan) significantly increased the yield of safflower seed. This was because treatments successfully reduced the lygus bugs, flower thrips, and sunflower moths, which had caused the greatest plant damage resulting in blasted buds and damaged seeds. Both compounds gave good control of the black bean aphids present, while only GS 13005 controlled spider mites, which were not present in any great numbers until just before harvest. The most numerous beneficial insect, *Orius*, the minute pirate bug, was drastically reduced in numbers by all of the chemicals in these experiments.

In 1967, both GS 13005 and Azodrin at 1 lb per acre gave good lygus bug control as shown in table 2. Endosulfan reduced lygus fairly well, while diazinon was unsatisfactory for the three-week count period after two sprayings. The population of lygus finally reached a treatment level of 25 bugs per sweep during the test period, but flower thrips were present in quite large numbers and were moderately to severely damaging. The yield data reflect the satisfactory control obtained as all the compounds tested resulted in a significant increase of seed per acre. However, the mortality of minute pirate bugs was high for all insecticides used although predaceous spiders were only slightly to moderately reduced.

Azodrin at 1 lb per acre also gave good control in aircraft plots at Robbins, California, in 1967; two spray applications were found to be superior to one.

Results of experiments with Bidrin in 1968, presented in table 3, indicate that two applications of the compound at the rate of 1 lb per acre are needed for satisfactory lygus bug control for a prolonged period of time. Additional data suggest that 2 lbs of the compound were inadequate when applied only once at the onset of blooming. The mortality of the minute pirate bug was not great in the experiments with Bidrin.

Of the chemicals screened in these tests, only endosulfan is registered and recommended for use on safflower for aphid control prior to the onset of blooming. For additional insecticide recommendations for safflower insects, the pest control guide on oil seed crops (available through county farm advisors) should be consulted.

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TABLE 1. PESTICIDE CONTROL OF FIVE INSECTS ON SAFFLOWER, DAVIS, 1966

Materials and amount active per acre*	Per cent reduction			Per cent reduction of severe bud and head damage due to:		Yeld of seed
	Lygus bugs	Aphids	Spider mites	Flower thrips	Sunflower moth	
	%	%	%	%	%	lbs/acre
GS 13005 ½ lb.	88	94	81	63	80	2,544
Endosulfan 1 lb.	77	100	36	63	66	2,509
AC 52160 ½ lb.	85	17	0	58	54	2,300
Check Untreated	—	—	—	—	—	1,917

* Two spray applications were made on severely infested late and irrigated safflower (7/29 and 8/8/66).

TABLE 2. EFFECTS OF PESTICIDES IN SAFFLOWER ON LYGUS AND PREDATORS, DAVIS, 1967*

Pesticides and amount active per acre	Average per cent reduction for 21 days after spraying			Yield
	Lygus adults + nymphs	Orius adults + nymphs	Predator spiders	
	%	%	%	lbs./acre
GS 13005 1 lb.	96	92	65	1,561
Azodrin 1 lb.	94	92	66	1,632
Endosulfan† 1 lb.	88	88	40	1,553
Diazinon† 1 ½ lb.	76	88	18	1,577
Check	—	—	—	1,362

* 25 lygus per sweep in checks.
† Two applications were made, on 6/26 and 7/3/67.

TABLE 3. EFFECTS OF BIDRIN SPRAY ON LYGUS AND PREDATORS, IN SAFFLOWER, DAVIS, 1968

Amount of active Bidrin per acre*	Average per cent reduction for 33 days after spraying			
	Lygus bugs		Minute pirate bug	
	Nymphs	Adults + Nymphs	Nymphs	Adults + Nymphs
	%	%	%	%
1 lb., 2 applications	93	83	68	35
2 lb., 1 application	63	72	9	6
1 lb., 1 application	49	52	18	27

* The 1st application was made on 6/21 and one treatment received a 2nd on 7/3/68.

Spider mites and webbing when severe in late season.