carried out for three years, and observations will be made on one field for the fourth year.

The long-term effectiveness of the 200 gal per acre rate (150 + 50 or 165 + 35) still remains to be demonstrated, despite apparent success with such applications in lighter soils. More experience with the higher rate of 250 gal per acre suggests that this treatment should be used, especially on heavy soils, until the results of more trials have been evaluated.

### Other current work

Methyl bromide is a satisfactory biocide for the control of many soil-borne diseases and weeds. Recent developments in the commercial application of this chemical under continuous polyethylene sheeting has suggested that this treatment may have good potential for control of the fanleaf virus-dagger nematode disease. However, preliminary tests have indicated that shallow application (4 to 6 inches) does not give satisfactory control in the deeper layers of soil. Additional trials are now underway to find ways to improve the effectiveness of this material. Trials now in progress or planned include: (1) a determination of the optimum depth to place the MBr (24 inches deep is greatly superior to 6 inches), (2) a determination of the optimum dosage needed for desired control, and (3) a determination of the effects of soil type and moisture content on dosage needed.

Soil fumigation with 1,3-D or MBr is costly—ranging from $300 to $600 per acre including application. However, it is encouraging that even though it is expensive there are practical procedures for control of this serious disease problem that are useful under field conditions.

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# *Herbicides for* WEED CONTROL

**These studies demonstrated the effectiveness of several herbicides (preplant incorporated in furrow-irrigated fields) for the selective control of weeds in sesame. Additional trials are needed to determine the effects on yield and oil quality—as well as the early retardation in growth of sesame caused by herbicides as compared with that caused by weed competition. The use of selective herbicides offers effective, economical weed control.**

SESAME (*Sesamum indicum* L.), sometimes referred to as benne, and one of the first oilseeds grown by man, belongs to the Pedaliaceae family. It has bell shaped flowers and the leaves are arranged opposite each other on the stem. There are many varieties of sesame, some with black, others with creamy white, dark red and brown seeds. It originated in Africa but today it is grown in many tropical and subtropical areas. In the United States it has been grown only in limited quantities because the shattering characteristics of the pod limited the effective mechanization of its harvest.

### Nonshattering mutant

The discovery of a nonshattering (indehiscent) mutant in 1943 aroused new interest in the crop because of the possibility of complete mechanization of production. In recent years increased attention was given to the selection and development of varieties in the San Joaquin Valley.

It was also realized that effective methods of weed control would have to be developed before sesame could profitably be produced. Investigators in the southeastern states have evaluated the tolerance of sesame to numerous herbicides. However, these investigations were conducted in areas where periodic rainfall during the growing season enables the effective use of surface applied preemergence herbicides. In the arid Central San Joaquin Valley where furrow irrigation is utilized in sesame production, herbicides applied on the surface of the soil failed to provide adequate weed control.

### Fresno County studies

In 1967, studies were initiated to evaluate the use of preplant-incorporated herbicides. In these early studies, herbicides widely used in cotton, soybeans and safflower were selected for evaluation. The rationale for this approach was that herbicides already registered for use in an oil crop could more easily be registered for use on sesame.

In 1968 it was believed that sesame in the San Joaquin Valley will be grown in a doublecropping system following barley or possibly other cereal grains. Therefore, barley was sown in the trials as a weed crop and some trials were established in fields following barley harvest.

Replicated trials were conducted on Panoche clay loam soil. Herbicides were applied with $CO_2$ constant pressure sprayers on preshaped beds. Following the application of herbicides they were incorporated into the soil to a depth of 2 to 2½ inches with power-driven rotary tillers.

Sesame, variety Baco, was planted at 2½ lbs per acre in the trials conducted prior to 1970. In the 1970 trials a semi-shattering variety, 215 was planted.

Barley was broadcast in the trial area, prior to bed shaping, as a weed crop in the 1969 and earlier trials. Mustard and Japanese millet were planted in the 1970 trial designated as Ss. Fr. 70-1 (see table 1). The second trial in 1970 was conducted in a field following barley harvest.

Stand counts, weed control and injury ratings were made in all trials, but no yield data were gathered.

In the three trials (see tables), several herbicides showed promise for the selective control of weeds in sesame when preplant incorporated. Some were found to control annual broadleaf weeds and grasses but failed to control volunteer barley. Others were found effective on annual grasses but provided erratic control of broadleaf weeds. Knowledge of the weed infestation or potential infestation is necessary to select the most effective and economical tools to use—whether mechanical or chemical—to control weeds in sesame.

BILL B. FISCHER

# IN SESAME

Some observations from the trials were: (1) Diphenamid effectively controlled volunteer barley and other annual weeds without adversely effecting sesame; (2) Prefar was well tolerated by sesame but failed to adequately control volunteer barley and was also erratic in controlling broadleaf weeds; (3) CIPC effectively controlled the barley but severely reduced the sesame stand when incorporated preplant; (4) Herban at 2 lbs of active ingredient per acre looked promising, but caused some stand reduction and growth retardation at 4 lbs per acre—and did not provide effective control of volunteer barley; (5) Lasso provided effective weed control and at 2 lbs of active ingredient per acre did not adversely effect the sesame but the stand was reduced at a 4 lb rate; and (6) Amiben was well tolerated by sesame but failed to control weeds when preplant incorporated.

Several other herbicides evaluated were found to be phytotoxic on sesame. Herbicides evaluated in all trials conducted in Fresno County since 1967 are listed in table 3 along with the relative tolerance of sesame to the herbicides when preplant incorporated. The relative effectiveness of the herbicides to control volunteer barley is also summarized.

The effective use of several herbicides preplant incorporated in furrow irrigated fields for the selective control of weeds in sesame was demonstrated. Additional trials need to be conducted studying the effect of herbicides like Herban, Lasso, Prefar and diphenamid on yield and oil quality. The relative effects of early retardation in the growth of sesame caused by herbicides versus retardation caused by weed competition also need close examination.

The projected costs of sesame production and the potential returns rule out the use of hand labor. The use of selective herbicides offer effective economical control of weeds.

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TABLE 1. STAND COUNT AND VISUAL RATINGS IN SESAME WEED CONTROL TRIAL WITH HERBICIDES Ss. Fr. 70–1 (PREPLANT INCORPORATED)

| Herbicide | lb ai/A | Stand Count† | | | | Visual Rating‡ | |
|---|---|---|---|---|---|---|---|
| | | Sesame | Pigweed | Mustard | Grass | Weed Control | Injury |
| Diphenamid | 5.0 | 97.0 | 0 | 1.0 | 0.3 | 9.8 | 3.0 |
| Prefar | 5.0 | 65.0 | 0 | 1.3 | 1.3 | 8.6 | 2.3 |
| Amiben | 4.0 | 55.0 | 4.0 | 1.3 | 63.6 | 1.0 | 2.0 |
| CIPC | 4.0 | 2.0 | 0 | 0 | 0 | 10 | 9.3 |
| Lasso | 2.0 | 85.6 | 0 | 0 | 0.6 | 10 | 3.3 |
| Lasso | 4.0 | 54.0 | 0 | 0.6 | 0 | 10 | 3.3 |
| Herban | 2.0 | 110.0 | 0 | 1.0 | 4.0 | 9.5 | 0.3 |
| Herban | 4.0 | 83.6 | 0 | 0 | 1.6 | 10 | 4.0 |
| Kerb | 1.0 | 1.3 | 0 | 0 | 0 | 10 | 9.6 |
| Kerb | 2.0 | 0.6 | 0 | 0 | 0 | 10 | 10 |
| Amiben<br>CIPC | 3.0<br>2.0 | 25.6 | 1.3 | 0 | 9.6 | 8.6 | 5.0 |
| Untreated | .... | 96.0 | 6.6 | 1.3 | 58.3 | 0 | 0 |

† Stand count made in two 6" × 4' areas in each plot. Values represent the average of 3 replications.
‡ Ratings based on a scale of 0–10. 0 = no weed control or injury. 10 = perfect weed control or death of plant injury rating, reflect growth retardation.

TABLE 2. STAND COUNT, INJURY, AND BARLEY CONTROL IN SESAME WEED CONTROL TRIAL WITH HERBICIDES (PREPLANT INCORPORATED) IN A DOUBLECROPPING SYSTEM

| Herbicides | lb ai/A | Stand Count† 7/14 | | Barley Control‡ | Injury Rating† |
|---|---|---|---|---|---|
| | | Sesame | Barley | 7/28 | 7/28 |
| Lasso | 2.0 | 65.5 | 9.0 | 7.3 | 0 |
| Lasso | 4.0 | 55.6 | 2.0 | 8.6 | 0 |
| Herban | 1.5 | 87.5 | 12.3 | 4.6 | 0 |
| Herban | 3.0 | 53.0 | 6.6 | 6.0 | 1.0 |
| CIPC | 3.0 | 27.6 | 0.6 | 9.3 | 4.0 |
| Diphenamid | 5.0 | 65.0 | 1.6 | 9.0 | 1.3 |
| Tenoran | 1.5 | 6.3 | 13.6 | 5.3 | 3.0 |
| Tenoran | 3.0 | 0.6 | 5.0 | 8.6 | 9.3 |
| Diphenamid<br>Lasso | 3.0<br>1.5 | 66.3 | 4.0 | 9.0 | 1.0 |
| Prefar | 6.0 | 83.0 | 3.6 | 8.6 | 0 |
| Prefar<br>Lasso | 3.0<br>1.5 | 77.0 | 7.0 | 7.6 | 0 |
| Untreated | ...... | 81.0 | 14.0 | 1.6 | 0.6 |

† Counts were made in two 4' × 6" areas in each plot. Values represent the average number of plants in 8 foot of row.
‡ Barley control and injury ratings are based on an 0 to 10 scale. O = no control or injury. 10 = perfect barley control or death of all plants. Injury ratings reflect primarily growth retardation.

TABLE 3. TOLERANCE OF SESAME TO SELECTED HERBICIDES EVALUATED IN FIELD TRIALS CONDUCTED IN FRESNO COUNTY AND THE EFFECTIVENESS OF THE HERBICIDES (PREPLANT INCORPORATED) IN CONTROLLING VOLUNTEER BARLEY*

| Herbicides | | lbs/A | Sesame | Barley |
|---|---|---|---|---|
| Trade Name | Common Name | Evaluated | Tolerance | Control |
| Alanap | naptalam | 5.0 | Poor | Poor |
| Amiben | amiben | 3.0 & 4.0 | Good | Poor |
| Balan | benefin | 1.25 | Poor | Erratic |
| CIPC | chloropropham | 3.0 & 4.0 | Poor | Good |
| Dacthal | DCPA | 8.0 | Poor | Erratic |
| Dymid or Enide | diphenamid | 5.0 & 6.0 | Good | Good |
| Eptam | EPTC | 3.0 | Poor | Good |
| Herban | norea | 1.5 & 3.0 | Fair | Poor |
| Kerb | H-315 | 1.0 & 2.0 | Poor | Good |
| Lasso | alachlor | 2.0 & 4.0 | Fair | Good |
| Maloran | C-6313 | 2.0 & 4.0 | Fair | Erratic |
| Planavin | nitralin | .75 & 1.0 | Poor | Erratic |
| Prefar | bensulide | 4.0 & 6.0 | Good | Poor |
| Sindone | ........ | 2.0 | Poor | Poor |
| Tenoran | chloroxuron | 1.5 & 3.0 | Poor | Poor |
| Treflan | trifluralin | 0.75 & 1.5 | Poor | Erratic |
| Trefmid | trifluralin + diphenamid | 0.25 & 4.0 | Poor | Good |
| Vernam | vernolate | 3.0 | Poor | Good |
| C-10725 | ........ | 2.0 | Fair | Poor |
| CP-53619 | ........ | 2.0 & 4.0 | Fair | Poor |
| EL-179 | isopropaline | 1.0 & 2.0 | Poor | Erratic |
| MB-9057 | ........ | 3.0 | Good | Poor |
| PPG-116 | ........ | 4.0 | Poor | Good |
| R-12001 | ........ | 3.0 & 6.0 | Poor | Fair |

* Compiled from nine replicated trials conducted since 1967 in Fresno County. Some herbicides were evaluated only in one trial, others were included in several trials.