Chemical Control/New Products

Walnut husk fly control with reduced risk insecticides

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Abstract: The effectiveness of registered insecticides for the control of walnut husk fly was evaluated in laboratory trials. In addition, field efficacy and longevity was evaluated for GF-120. In the laboratory trials, Success with NuLure and Malathion with and without NuLure provided significantly greater WHF mortality than Pyganic and Success without NuLure. There was also a rate response with Success. The field longevity of GF-120 decreased rapidly from 0 to 3 days after treatment. GF-120 provided effective control of WHF in the field efficacy trial. The amount of GF-120 per acre and/or the number of applications needed to suppress a WHF population is dependent on the WHF density. GF-120 is slow acting and has limited field longevity in the San Joaquin Valley.

Materials and Methods

Laboratory Evaluations. Treatments were replicated five times. Individual walnut leaves were treated using a hand-held sprayer with a final spray volume of 1 ml. There was a blank bait untreated control evaluated simultaneously with each experimental treatment. To keep the leaves viable, each leaf stem was placed in a small water filled vial. After the leaves were sprayed, they were allowed to dry (1 hr) and were placed individually into a 4 L cage with 10 male and 10 female field-collected WHF. The WHF were pre-fed a 5% honey solution. Mortality was determined at 12 and 24 hours after treatment.

Field Longevity. The trial was conducted in Tracy, CA. Longevity of GF-120 was determined by placing one and five 20 µl drop(s) of a 1:4 dilution on individual leaves on August 7. An individual leaf with 1 or 5 drops was placed into a 4 L cage with 10 male and 10 female field collected WHF. There was an untreated control of 1 and 5 drops of blank bait solution evaluated simultaneously with the treatments. The WHF were pre-fed a 5% honey solution. Mortality at 24 hours was determined with leaves aged 0, 3, 7 and 14 days. Each leaf age/droplet type was replicated five times.

Field Efficacy. Trials were conducted in three commercial orchards in the San Joaquin Valley of California. Orchard No. 1 was an interplant with 'Chandler'/'Eureka' cultivars, Orchards No. 2 and 3 were solid planted with 'Chandler' cultivar. Five treatments were replicated three times in a randomized complete block design. Each replicate was about 3 acres in size. The GF-120 was diluted 1:4. Treatments were applied with a modified weed sprayer that was mounted on an ATV and delivered from 50 oz to 200 oz/acre. The treatments in Orchard No. 1 were 40 oz of GF-120 per acre applied every other week, 20 oz of GF-120 per acre applied every

week, 40 oz of GF-120 per acre applied every week, 20 oz of blank bait per acre applied every other week and a grower standard. The grower standard of 3 pints Malathion and 3 pints NuLure in 100 gallons of water per acre was applied on July 10 and 31. The treatments in Orchard No. 2 were 20 oz of GF-120 per acre applied every other week, 10 oz of GF-120 per acre applied every week, 20 oz of GF-120 per acre applied every week, 10 oz of blank bait per acre applied every other week and a grower standard. The grower standard of 3 pints Lorsban and 4 pints NuLure in 50 gallons of water per acre was applied on July 17 and August 12 with a two-week alternate row split application. The treatments in Orchard No. 3 were 20 oz of GF-120 per acre applied every other week, 10 oz of GF-120 per acre applied every week, 20 oz of GF-120 per acre applied every week, 10 oz of blank bait per acre applied every other week and a grower standard. The grower standard of 2 pints Lorsban and 3 pints NuLure in 200 gallons of water per acre on every row was applied on August 15. GF-120 applications were initiated on July 10 in Orchard No. 1, July 17 in Orchard No. 2 and August 15 in Orchard No. 3. Applications were terminated on September 19 at the beginning of husk split in Orchards Nos. 1 and 2 while applications were terminated on August 28 in Orchard No. 3.

The efficacy of the treatments was evaluated by placing one super-charged yellow AM trap in the center of each plot. The traps were monitored weekly from June through husk split. At husk split on September 19, 1000 nuts per plot (3000 nuts per treatment) were inspected for WHF infestation in Orchard Nos. 1 and 2.

Results and Discussion

Laboratory Evaluations. At 12 hours, Malathion with and without NuLure and Asana provided significantly greater WHF mortality compared to the other materials (Table 1). At 24 hours, Malathion with and without NuLure and Success with NuLure provided significantly greater WHF mortality than Pyganic and Success without NuLure. Success with NuLure at 12 and 24 hours caused significantly more WHF mortality compared to Success without NuLure, while there was no noticeable effect of NuLure with Malathion. This shows that Success is slow acting and needs to be consumed to be effective while Malathion is fast acting and has contact activity. There was a rate response for Success with NuLure at 24 hours. Success at 0.1 oz plus 3 pt NuLure/100 gal produced about 25% mortality while mortality increased to about 65% with Success at 3 oz plus 3 pt NuLure/100 gal (Fig. 1).

Field Longevity. WHF mortality decreased rapidly from nearly 70% mortality at 0 DAT to 20% at 3 DAT (Fig. 2). Five droplets per leaf caused slightly greater mortality than 1 droplet per leaf at 0 and 3 days after treatment (DAT). The short longevity may be the result of using wild flies and the hot, dry conditions found in the west side of San Joaquin Valley.

Field Efficacy. The WHF population in Orchard No. 1 was extremely high and the orchard had over 75% infested fruit the previous year (Table 2). Repeated applications of GF-120 at 20 and 40 oz per acre applied weekly or every other week resulted in a significant reduction in fruit infestation compared to the blank bait or grower standard, but there was no significant difference among the GF-120 treatments. Despite the large reduction in fruit infestation, there was not a corresponding reduction in adult fly captures. Adult fly captures were extremely high with over 300 adult flies captured in the 40 oz of GF-120 applied every week.

Therefore, it appears that GF-120 is slow acting and flies were trapped but oviposition was prevented. It should be noted that, due to the irregular size of trees and missing trees, the application efficiency was about 60%, i.e., 40% of the final spray volume was not retained on the trees. Thus the amount of GF-120 required to control the population could be greatly reduced with a more uniform orchard.

The WHF population in Orchard No. 2 was moderate and the orchard had less than 10% infested fruit the previous year (Table 3). Repeated applications of GF-120 and blank bait at 10 oz per acre applied weekly and every other week resulted in a significant increase in fruit infestation compared to the grower standard while 20 oz per acre applied weekly or every other week was not significantly different than the grower standard. It appears that 10 oz per acre was not sufficient to suppress this moderate population. This orchard was much more uniform in size with few missing trees, and the application efficiency was about 80%.

The WHF population in Orchard No. 3 was very low and the orchard had less than 10% infested fruit the previous year. The initial application of GF-120 and the grower standard resulted in the complete elimination of adult WHF in all treatments including the blank bait control. Due to the reduction in WHF, the experiment was terminated in this orchard. Also this orchard was extremely uniform with few missing trees, and the application efficiency was about 90 to 95%.

Conclusion. GF-120 provided effective control of WHF. The amount of GF-120 per acre and/or the number of applications needed to suppress a WHF population is dependent on the WHF density. GF-120 is slow acting and has limited field longevity in the San Joaquin Valley. Until GF-120 becomes registered, Success combined with NuLure would be an effective replacement for Malathion.

Table 1. Laboratory efficacy of registered insecticides for WHF control

		Mean % corrected mortality	
Treatments	Rate/100 gal.	12 hours	24 hours
Malathion[a]	3 pt	64 a	75 a
Malathion	3 pt	50 ab	74 a
Success[a]	1 oz	13 c	61 ab
Success	1 oz	1 d	9 c
Asana[a]	16 oz	36 b	45 b
Pyganic[a]	18 oz	2 d	11 c

[a]Treatments contain 3 pt. NuLure / 100 gal.
Means followed by the same letter within a column are not significantly different (Fisher's protected LSD, $P \leq 0.05$). Data analyzed using an arcsin transformation.

Table 2. Field evaluations of GF-120 in Orchard No. 1 near Stockton, CA

Treatment	Application schedule	Mean total flies/trap	Mean % infested fruit
40 oz. GF-120/ac	every other week	588.3 ab	1.3 a
20 oz. GF-120/ac	every week	542.0 a	0.7 a
40 oz. GF-120/ac	every week	323.7 a	0.7 a
20 oz. Blank Bait	every other week	590.0 ab	5.3 b
Grower Standard	——	992.0 b	23.2 c

Means followed by the same letter within a column are not significantly different (Fisher's protected LSD, $P \leq 0.05$). Data analyzed using an arcsin transformation.

Table 3. Field evaluations of GF-120 in Orchard No. 2 near Stockton, CA

Treatment	Application schedule	Mean total flies/trap	Mean % infested fruit
20 oz. GF-120/ac	every other week	90.7 ab	8.1 ab
10 oz. GF-120/ac	every week	146.3 b	14.3 b
20 oz. GF-120/ac	every week	36.0 ab	2.4 ab
10 oz. Blank Bait	every other week	137.7 ab	18.4 b
Grower Standard	——	5.3 a	0.0 a

Means followed by the same letter within a column are not significantly different (Fisher's protected LSD, $P \leq 0.05$). Data analyzed using an arcsin transformation.

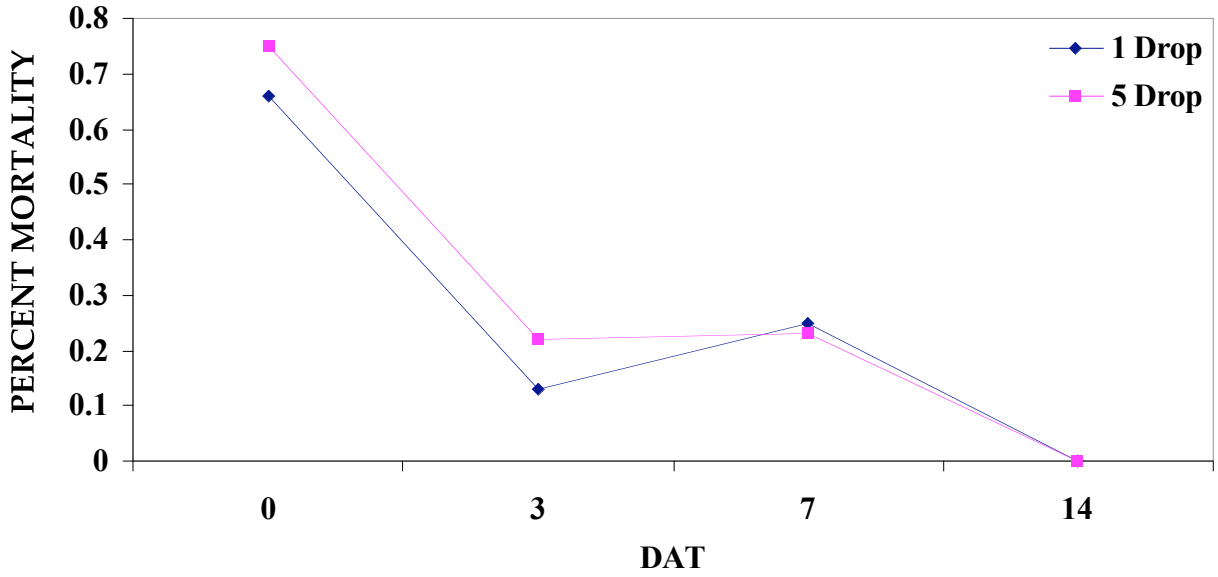

Fig. 1. Longevity trial of GF-120 on WHF at Tracy, CA.

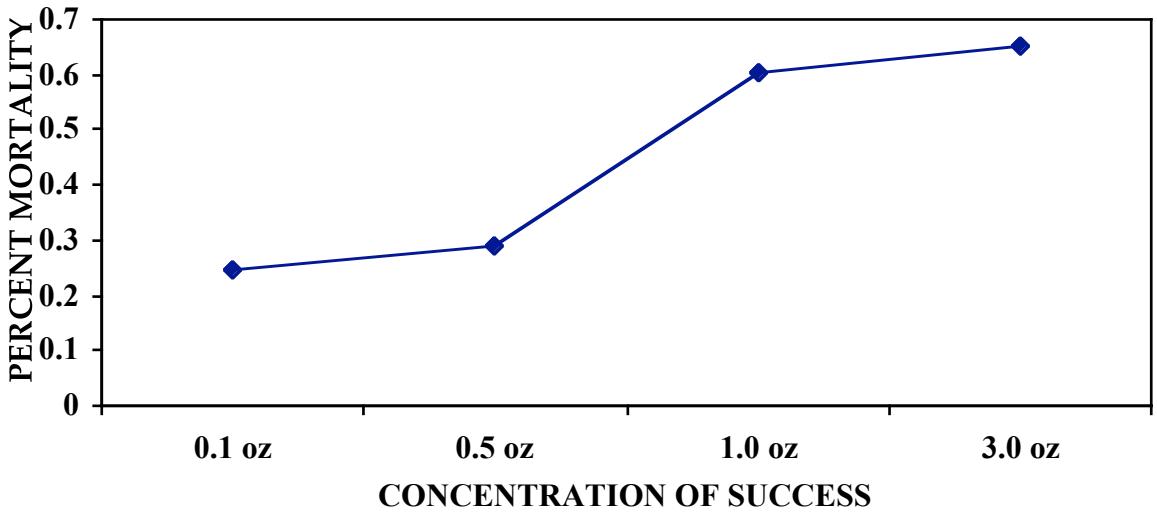

Fig. 2. WHF laboratory mortality of Success.