CONTROL OF WALNUT HUSK FLY USING REDUCED RISK PRODUCTS

R. A. Van Steenwyk, S. K. Zolbrod, R. M. Nomoto, and T. K. Fernandez

ABSTRACT

Field trial evaluations for walnut husk fly (WHF) control were conducted in Hollister and Escalon, CA to improve the efficacy and reliability of Entrust/Success plus NuLure and GF-120. These studies included rate comparisons of Success/Entrust, dilution effects of GF-120 and increasing the attraction of GF-120 with increased amounts of ammonia acetate. Results from these studies indicate that the amount of Success/Entrust can be dramatically reduced below the recommended field rate of 6.4 oz Success or 2 oz of Entrust per acre plus 3 pt NuLure per acre. Excellent WHF control was achieved with 1.6 oz of Success or 0.5 oz of Entrust per acre plus 3 pt NuLure per acre provided adequate coverage can be achieved by the speed sprayer. Also under very low populations the rate can be further reduced to 0.8 oz of Success or 0.25 oz of Entrust. There does not appear to be a significant difference in efficacy between a GF-120 dilution rate of 1:1.5 to a dilution rate of 1:9. However, there is some indication that more concentrated GF-120 spray solution (1:1.5) is preferable in a low humidity and low population situation compared to dilute concentrations (1:9). There was not enhancement of the efficacy of GF-120 by increasing the amount of ammonia acetate. A trap height comparison study resulted in a larger number of fly captures in high traps.

OBJECTIVES

The walnut husk fly (WHF), *Rhagoletis completa*, is a serious pest of walnuts. It is speculated that as the use of organophosphate (OP) insecticides is restricted by EPA action, WHF will become a more serious pest. Without OP insecticides for WHF control, growers will rely on pyrethroid insecticides, e.g. Asana, Pounce. However, past research has demonstrated that the pyrethroid insecticides are less effective than the OP insecticides for WHF control. In addition, the pyrethroid insecticides can cause flare-ups of secondary pests, such as spider mites. Spinosad under the trade name Entrust for organic growers or Success for conventional growers and GF-120 fruit fly bait for both conventional and organic growers are registered for use on walnuts. GF-120 provides effective control of a number of tropical fruit flies. Past research has demonstrated that effective control of WHF can be achieved with repeated applications of GF-120. However, there are some indications that GF-120 should be applied earlier in the season than conventional insecticides and that control of high populations of WHF with GF-120 may be challenging. In addition to GF-120, Entrust or Success combined with NuLure bait may be an effective substitution for an OP insecticide and NuLure. It is important to determine how to make these products work since they are important non-OP alternatives for the future. Currently, OP insecticides such as Malathion, Lorsban or Imidan plus NuLure bait provide effective control of WHF at a reasonable cost. However, the continued registration of these products is uncertain in the long-term. GF-120 and Entrust or Success plus NuLure may provide very cost effective non-OP WHF control without resulting in the secondary pest flare-ups caused by pyrethroid

insecticides. Studies were conducted to improve the efficacy and reliability of Entrust/Success plus NuLure and GF-120 for WHF control. These studies included rate comparisons of Success/Entrust, dilution effects of GF-120 and increasing the attraction of GF-120 with ammonia acetate.

METHODS AND MATERIALS

A. Rate Comparisons of Success/Entrust

A trial was conducted in a commercial Payne orchard (Hollister 1) in Hollister. Four treatments were replicated three times in a randomized complete block (RCB) design. Each replicate was 2 to 5 acres in size. All treatments were applied to every other row (skip row). The four treatments were: Entrust at 1 oz/ac, 0.5 oz/ac and 0.25 oz/ac (with 3 pt NuLure per acre as bait) and a blank bait control (3 pt NuLure per acre). Entrust was applied with an air-blast sprayer with a final spray volume of 40 gal/ac. There was a single application of Entrust and the blank bait control on 2 August. The efficacy of the treatments was evaluated by placing one super charged yellow AM panel trap low in the tree canopy in the center of each plot. The control treatment was also monitored with a trap placed high in the tree canopy. The traps were monitored weekly from early June to husk split. At the beginning of husk split on 8 September 1000 nuts per plot (3000 nuts per treatment) were inspected for WHF infestation low (6 to 8 ft) in the tree canopy. Application and material costs were obtained from the grower to evaluate economic costs.

A second trial was conducted in a commercial Chandler orchard (Escalon 1) in Escalon. Three treatments were replicated three times in a RCB design. Each replicate was 3 acres in size. All treatments were applied to every other row (skip row). The three treatments were: Success at 3.2 oz/ac, 1.6 oz/ac (with 3 pt NuLure per acre as bait) and a blank bait control (3 pt NuLure per acre). Success was applied with an air-blast sprayer with a final spray volume of 25 gal/ac. The applications of Success and the blank bait control were initiated on 21 July. Further applications were applied weekly from 3 August to 31 August. One control replicate was sprayed out on 24 August while the rest of the control replicates were sprayed out the following week on 31 August. The decision to treat the control was based on 5% or greater infestation observed at weekly inspections of 100 nuts or more from each untreated control replicate. The efficacy of the treatments was evaluated by placing one super charged yellow AM panel trap low in the tree canopy in the center of each plot. The control treatment was also monitored with a trap placed high in the tree canopy. The traps were monitored weekly from early June to husk split. At the beginning of husk split on 7 September, 1000 nuts per plot (3000 nuts per treatment) were inspected for WHF infestation both low (6 to 8 ft) in the tree canopy and high (25 to 30 ft) in the tree canopy. Application and material costs were obtained from the grower to evaluate economic costs.

A third trial was conducted in a commercial Serr/Hartley orchard (Escalon 2) in Escalon. Three treatments were replicated three times in a RCB design. Each replicate was 3 acres in size. All treatments were applied to every row. The three treatments were: Success at

3.2 oz/ac, 1.6 oz/ac (with 3 pt NuLure per acre as bait) and a blank bait control (3 pt NuLure per acre). Success was applied with an air-blast sprayer with a final spray volume of 70 gal/ac. The applications of Success and the blank bait control were initiated on 18 July. Further applications were applied weekly from 3 August to 31 August. The trees in this orchard were extremely tall (greater than 60 ft) and even when spraying every row at 70 gal/ac only partial coverage (about 35 ft.) could be obtained. One control replicate was sprayed out on 10 August, while the rest of the control replicates were sprayed out on 17 August. The decision to treat the control was based on 5% or greater infestation observed at weekly inspections of 100 nuts or more from each untreated control replicate. The efficacy of the treatments was evaluated by placing one super charged yellow AM panel trap low in the tree canopy in the center of each plot. The control treatment was also monitored with a trap placed high in the tree canopy. The traps were monitored weekly from early June to husk split. At the beginning of husk split on 7 September, 1000 nuts per plot (3000 nuts per treatment) were inspected for WHF infestation high (25 to 30 ft) in the tree canopy. Application and material costs were obtained from the grower to evaluate economic costs.

B. Dilution of GF-120

A trial was conducted in a commercial Chandler orchard (Escalon 3) in Escalon. Four treatments were replicated three times in a RCB design. Each replicate was over 3 acres in size. The three treatments were: GF-120 (20 oz/ac diluted to 1:9) applied weekly, GF-120 (20 oz/ac diluted to 1:4) applied weekly, GF-120 (20 oz/ac diluted to 1:1.5) and a blank bait control (20 oz/ac blank GF-120 diluted to 1:4). The GF-120 and blank GF-120 treatments were applied using a modified spot sprayer mounted on an ATV. The GF-120 treatments and the blank bait control treatment were initiated on 20 July and terminated on 31 August. The efficacy of the treatments was evaluated by placing one super charged yellow AM panel trap low in the tree canopy in the center of each plot. In addition to the low trap, the control treatment was also monitored with a trap placed high in the tree canopy. The traps were monitored weekly from early June to husk split. At the beginning of husk split on 7 September, 1000 nuts per plot (3000 nuts per treatment) were inspected for WHF infestation low (6 to 8 ft) in the tree canopy. Application and material costs were obtained from the grower to evaluate economic costs.

A second trial was conducted in another commercial Chandler orchard in Escalon (Escalon 4). Three treatments were replicated three times in a RCB design. Each replicate was about 3 acres in size. The three treatments were: GF-120 (20 oz/acre diluted to 1:9) applied to every other row weekly, GF-120 (20 oz/ac diluted to 1:1.5) applied to every other row weekly, and a blank bait control (20 oz/ac blank GF-120 diluted to 1:4). The GF-120 and blank GF-120 treatments were applied using a modified weed sprayer mounted on an ATV. The GF-120 treatments and blank bait control treatment were initiated on 20 July and terminated on 31 August. The blank bait control was sprayed out on 24 August with GF-120 (20 oz/ac diluted to 1:1.5). The decision to treat the control was based on 5% or greater infestation observed at weekly inspections of 100 nuts or more from each untreated control replicate. The efficacy of the treatments

was evaluated by placing one super charged yellow AM panel trap low in the tree canopy in the center of each plot. The control treatment was also monitored with a trap placed high in the tree canopy. The traps were monitored weekly from early June to husk split. At the beginning of husk split on 7 September, 1000 nuts per plot (3000 nuts per treatment) were inspected for WHF infestation low (6 to 8 ft) in the tree canopy. Application and material costs were obtained from the grower to evaluate economic costs.

C. Increase Attractiveness of GF-120

A trial was conducted in a commercial Payne orchard (Hollister 2) in Hollister. Three treatments were replicated three times in a RCB design. Each replicate was 2 to 4 acres in size. The three treatments were: GF-120 (20 oz/ac diluted to 1:4), GF-120 enhanced with 10% ammonium acetate (12.5% total materials) by weight (20 oz/ac diluted to 1:4) and a blank bait control (20 oz blank GF-120 diluted 1:4 per acre). The treatments were applied to every other row using a modified weed sprayer mounted on an ATV. The treatments were initiated on 12 July, treated again on 2 August and the final spray was 15 August. The control treatment was sprayed out on 15 August with Entrust (1 oz/ac with 3 pt NuLure per acre as bait). The decision to treat the control was based on 5% or greater infestation observed at weekly inspections of 100 nuts or more from each untreated control replicate. Entrust was applied to every other row with an air-blast sprayer with a final spray volume of 40 gal/ac. The efficacy of the treatments was evaluated by placing one super charged yellow AM panel trap low in the canopy of a tree in the center of each plot. The control treatment was also monitored with a trap placed high in the tree canopy. The traps were monitored weekly from early June to husk split. At the beginning of husk split on 8 September, 1000 nuts per plot (3000 nuts per treatment) were inspected for WHF infestation low (6 to 8 ft) in the tree canopy. Application and material costs were obtained from the grower to evaluate economic costs.

RESULTS AND DISCUSSION

A. Conventional Application Methodology – Rate Comparisons

The WHF population in Hollister 1 was very low this year (Fig. 1). At harvest, there was no significant difference in infestation among any of the treatments (Table 1). However numerically infestation in the control was much higher, which corresponded to the mean total flies caught for the season. There was no rate effect among the treatments with the lowest application rate having the fewest number of flies for the season. There was no significant difference in the mean number of flies caught in the AM panel traps placed high in the tree canopy versus traps placed low in the tree (Table 2). The trees in this orchard were only about 20 ft tall and there was an open canopy. Mid way through the season, the high traps in the control began collecting more flies. However, because of the extreme variability in the number of flies caught, there was no significant difference for the season. The total cost per acre for the WHF control in Hollister 1 was very low. The low number of flies required only one application with a total cost from $20 to $37 per acre (Table 3).

In addition, due to the low tree height and open tree canopy, the air-blast application could be applied to every other row and at a high ground speed compared to the other orchards in the study. This resulted in a much reduced cost of application (Table 4).

The WHF population in Escalon 1 was very high for the season (Fig 2). The high number of flies present in this orchard was the result of over 80% of the nuts being infested in the 2004 season and the orchards was not harvested in 2004. Due to the potential of large infestation, as well as the sharp peak in the population on 21 July (Fig. 2), applications were initiated immediately after trap inspection on 21 July. For the season, there were six applications of Success and NuLure. There was no difference in the amount of infestation between the two rates of Success, but there was a significant difference in infestation between the Success treatments and the control (Table 5). Also, the infestation evaluation in the lower canopy was about half of the infestation observed in the upper canopy. This corresponds with the high trap catch in the upper canopy. Thus 1.6 oz of Success per acre was as efficacious as 3.2 oz of Success. Due to the similar infestation levels seen between the two rates of Success, the increased cost of the higher rate of Success was not justified (Table 6).

The WHF population in Escalon 2 was extremely high for the season with traps saturated on 8 August (Fig. 3). The high number of flies present in this orchard was the result of near 100% nut infestation in the 2004 season. Applications were initiated on 18 July with repeated applications throughout the season (Fig. 3). Even with the frequent applications of Success, there were still a large number of flies caught in the orchard. The number of flies caught in the low rate of Success was significantly higher than the control of the high rate of Success (Table 7). However, at harvest, there was a significant rate effect among the treatments. The 3.2 oz/ac treatment had about half of the infestation compared to the 1.6 oz/ac which in turn was about half of the infestation in the control. Even the low rate of Success resulted in marked improvement in the WHF infestation compared to the previous year's infestation. Also, the control treatment, which had over 30% at harvest, was significantly improved over the previous year. However, despite repeated applications, the control still had an unacceptable level of infestation. It was not possible to stop the increase in infestation with repeated applications of Success and NuLure. In previous trials, it had been possible to significantly suppress adult flight and stabilize the infestation with repeated applications of Success and NuLure. The high level of infestation was attributed to the extremely large WHF population and poor coverage by the air-blast sprayer. The air-blast sprayer could only reach about 35 ft in the tree canopy, leaving about 20 to 25 ft of the canopy uncovered with Success and NuLure. There were also significantly more flies caught in the higher traps compared to traps placed lower in the canopy. It appears that NuLure is not an effective WHF attractant but more of a feeding stimulant. Thus if WHF finds the Success and NuLure then the flies will feed but flies will not be drawn to the Success and bait. Previous studies have shown that Success must be ingested to be effective and it has no fuming effect. Thus in orchards with an extremely high WHF populations where good coverage cannot be achieved, Success and NuLure should not be used. Application costs for the orchard were very expensive due to the multiple applications as well as the speed the air-blast sprayer (Table 8). The speed sprayer traveled at 1.5 mph to attain the best coverage possible (Table 4).

B. Dilution Effect

The WHF population was low to moderate in Escalon 3 for the season (Fig. 4). There was no significant difference among the treatments in the number of flies caught (Table 9). However there appeared to be a numerical trend indicating that trap captures increased with a lower amount but high concentration of Success and NuLure. The 1:9 dilution rate had captured about one half the number of flies as the 1:1.5 dilution. The 1:9 dilution rate enables more GF-120 point sources to be present in the orchard. However the 1:9 dilution rate is also more susceptible to dehydration of the GF-120 possibly resulting in a less effective product. In Escalon 3, there was a closed canopy with little direct sun and higher humility than other orchards and the 1:9 dilution rate was not subject to rapid dehydration. Thus the 1:9 dilution provided more readily accessible point sources of the toxin. There was a significant difference in infestation between the GF-120 treatments and the control. Although there was no significant difference between the low trap placement and high trap placement, the higher trap placement resulted in a larger number of flies caught throughout the season. As seen in Fig. 4, the high trap placement gives a clearer picture of adult activity as compared to low traps during the crucial period of the season when treatment decisions need to be considered. Application costs for the ATV sprayer varied among the orchards due to the different tree spacing (Table 10). In Escalon 3, the cost per acre for the different dilution rates was similar (Table 11). The difference in mixing times between dilution rates as well as the speed of the ATV rig resulted in slightly different costs for the season.

The WHF population in Escalon 4 was low to moderate for the season (Fig. 5). There was no significant difference between the treatments in the number of flies caught (Table 12). However there was a numerical trend indicating that the 1:1.5 dilution of GF-120 had lower infestation compared to the 1:9 dilution treatment (Table 12). Due to the open canopy structure of the orchard, the 1:1.5 dilution rate may have retained its moisture to a greater extent compared to the 1:9 dilution, which resulted in increased efficacy. The flight data also showed the same trends (Fig. 5). Also, there were significantly more flies being caught in the higher trap. Application costs were slightly more expensive in the 1:9 dilution treatment due to the slower speed and longer mixing times needed (Table 14).

C. Increase Attractiveness of GF-120

The WHF population in Hollister 2 was low for the season (Fig 6). Three applications of GF-120 maintained the WHF population within acceptable levels. There was no significant difference in the number of flies caught throughout the season (Table 14). However, there were significantly more WHF captured in the high traps compared to the low traps (Table 2). There was significantly higher infestation in the untreated control compared to the GF-120 treatments, but no significant difference between the GF-120 treatments. Due to the low number of flies present in the orchard, it was not possible to determine whether there was an increase in attractiveness of boosted GF-120. Application cost for the season was reasonable due to the low fly population (Table 16).

CONCLUSIONS

Success/Entrust combined with NuLure provided cost effective control of WHF. The amount of Success/Entrust can be dramatically reduced below the recommended field rate of 6.4 oz Success or 2 oz of Entrust per acre plus 3 pt NuLure per acre. Excellent WHF control was achieved with 1.6 oz of Success or 0.5 oz of Entrust per acre plus 3 pt NuLure per acre provided the speed sprayer can achieve adequate coverage. Also under very low populations the rate can be further reduced to 0.8 oz of Success or 0.25 oz of Entrust. There does not appear to be a significant difference in efficacy between a GF-120 dilution rate of 1:1.5 to a dilution rate of 1:9. However, there is some indication that more concentrated GF-120 spray solution (1:1.5) is preferable in low humidity and low population situations than more dilute concentrations (1:9). There was not enhancement of the efficacy of GF-120 by increasing the amount of ammonia acetate.

ACKNOWLEDGEMENTS

We gratefully acknowledge the following personnel whose assistance made the above studies possible: M. Adrian, M. Alameda, B. Bisabri, A, Dugo, J. Gambini, M. Gibson, S. Jim, D. Ventura and J. Wagner.

Table 1. Mean number of WHF per season and infestation at Hollister 1, CA – 2005

Treatment	Rate	No.of applications	Mean total flies/trap[a]	Mean % infested nut[a]
Entrust	0.25 oz	1	3.7 a	0.3 a
Entrust	0.50 oz	1	5.3 ab	0.4 a
Entrust	1.00 oz	1	9.7 ab	0.3 a
Control	—	—	13.3 b	1.9 a

[a]Means followed by the same letter within a column are not significantly different (Fisher's protected LSD, P = 0.05).

Table 2. Mean number of WHF per season in high versus low traps – 2005

	Mean total flies/trap[a]	
Orchard	High trap	Low trap
Hollister 1***	59.3 a	13.3 a
Hollister 2*	148.3 a	83.7 b
Escalon 1***	928.7 a	763.3 a
Escalon 2*	2636.3 a	1613.0 b
Escalon 3***	295.3 a	141.0 b
Escalon 4*	315.0 a	127.0 b

[a]Means followed by the same letter within a row are not significantly different (Student's T-test, * =P = 0.05, ** =P = 0.10 and *** = P = 0.15).

Table 3. Total cost per acre for the season in Hollister 1, CA – 2005

Treatment	Rate	No. of applications	Total cost/ac/season[a]
Entrust	0.25 oz	1	$ 20.21
Entrust	0.50 oz	1	$ 25.66
Entrust	1.00 oz	1	$ 36.54

[a]Cost includes 20 min/10 ac refill

Table 4. Application cost of air-blast sprayer for WHF control – 2005

Orchard	Cost/hr	mph	No. of ac/hr	Cost/ac[a]
Hollister 1	$ 76.00	4.2	16.29	$ 4.67
Escalon 1	$ 76.00	2.25	12.50	$ 6.08[b]
Escalon 2	$ 76.00	1.5	7.27	$ 10.45

[a]Cost includes 20 min/10 ac refill
[b]Cost includes 20 min/20 ac refill

Table 5. Mean number of WHF per season and infestation at Escalon 1, CA – 2005

Treatment	Rate	No. of applications	Mean total flies/trap[a]	Mean % infested nut[a]	
				High count[a]	Low count[b]
Success	1.6 oz	6	897.7 a	0.2 a	0.1 a
Success	3.2 oz	6	634.0 a	0.2 a	0.1 a
Control	—	—	763.3 a	3.4 b	1.6 b

[a]Means followed by the same letter within a column are not significantly different (Fisher's protected LSD, P = 0.05).
[b]Means followed by the same letter within a column are not significantly different (Fisher's protected LSD, P = 0.10).

Table 6. Total costs per acre for the season in Escalon 1, CA – 2005

Treatment	Rate	No. of applications	Total cost/ac/season
Success	1.6 oz	6	$ 138.38
Success	3.2 oz	6	$ 186.27

[a]Cost includes 20 min/20 ac refill and 3 pt NuLure/ac

Table 7. Mean number of WHF per season and infestation at Escalon 2, CA – 2005

Treatment	Rate	No. of applications	Mean total flies/trap[a]	Mean % infested nut[a]
Success	1.6 oz	6	2041.0 a	17.3 b
Success	3.2 oz	6	1591.3 b	7.2 a
Control	—	—	1613.0 b	34.5 c

[a]Means followed by the same letter within a column are not significantly different (Fisher's protected LSD, P = 0.05).

Table 8. Total costs per acre for the season in Escalon 2, CA – 2005

Treatment	Rate	No. of applications	Total cost/ac/season
Success	1.6 oz	6	$ 169.20
Success	3.2 oz	6	$ 221.70

[a]Cost includes 20 min/7 ac refill and 3 pt NuLure/ac

Table 9. Mean number of WHF per season and infestation at Escalon 3, CA – 2005

Treatment	Rate	No. of applications	Mean total flies/trap[a]	Mean % infested nut[a]
GF-120 (1:9)	20.0 oz	4	51.3 a	0.0 a
GF-120 (1:4)	20.0 oz	4	84.3 a	0.1 a
GF-120 (1:1.5)	20.0 oz	4	97.0 a	0.1 a
Control	—	—	141.0 a	0.4 b

[a]Means followed by the same letter within a column are not significantly different (Fisher's protected LSD, P = 0.05).

Table 10. Application cost for ATV sprayer going 7 mph for WHF control – 2004

Orchard	Cost/hr	No. of ac/hr[a]	Cost/ac[c]
Hollister 1	$ 17.51	28.00	$ 0.95
Escalon 4	$ 16.46	31.82	$ 0.83
Escalon 3	$ 13.45	35.00	$ 0.76

[a]GF-120 applied as a skip row treatment
[c]Cost includes 5 min/15 ac refill

Table 11. Total costs per acre for the season in Escalon 3, CA – 2005

Treatment	Rate	No. of applications	Total cost/ac/season[a]
GF-120 (1:1.5) [b]	20.0 oz	4	$ 52.14
GF-120 (1:4) [c]	20.0 oz	4	$ 53.81
GF-120 (1:9) [d]	20.0 oz	4	$ 57.59

[a]Cost includes 5 min/15 gal refill
[b]GF-120 applied as a skip row treatment traveling at 14.0 mph
[c]GF-120 applied as a skip row treatment traveling at 7.0 mph
[d]GF-120 applied as a skip row treatment traveling at 3.5 mph

Table 12. Mean number of WHF per season and infestation at Escalon 4, CA – 2005

Treatment	Rate (/ac)	# of Applications	Mean Total Flies/Trap[a]	Mean % Infested Nut[a]
GF-120 (1:1.5)	20.0 oz	7	42.7 a	2.0 a
GF-120 (1:9)	20.0 oz	7	82.3 a	1.7 a
Control	—	—	127.0 a	14.2 b

[a]Means followed by the same letter within a column are not significantly different (Fisher's protected LSD, P = 0.05).

Table 13. Total costs per acre for the season in Escalon 4, CA – 2005

Treatment	Rate	No. of applications	Total cost/ac/season[a]
GF-120 (1:1.5) [b]	20.0 oz	7	$ 112.00
GF-120 (1:9) [c]	20.0 oz	7	$ 122.49

[a]Cost includes 5 min/15 gal refill
[b]GF-120 applied as a skip row treatment traveling at 14.0 mph
[c]GF-120 applied as a skip row treatment traveling at 3.5 mph

Table 14. Mean number of WHF per season and infestation at Hollister 2, CA – 2005

Treatment	Rate	No. of applications	Mean total flies/trap[a]	Mean % infested nut[b]
GF-120	20.0 oz	3	22.7 a	0.2 a
GF-120 Boosted	20.0 oz	3	19.5 a	0.3 a
Control	—	—	83.7 a	8.7 b

[a]Means followed by the same letter within a column are not significantly different (Fisher's protected LSD, P = 0.05).
[b]Means followed by the same letter within a column are not significantly different (Fisher's protected LSD, P = 0.10).

Table 15. Total costs per acre for the season in Hollister 2, CA – 2005

Treatment	Rate	No. of applications	Total cost/ac/season[a]
GF-120	20.0 oz	3	52.53

[a]Cost includes 5 min/15 ac refill
[b]GF-120 applied as a skip row treatment traveling at 7mph