Research Paper :

Management of major insect pests of sunflower

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SUMMARY

A field trial was conducted to study the management of major insect pests (*Amrasca biguttula biguttula, Bemisia tabaci* and *Helicoverpa armigera*) of summer sunflower. The results indicated that the combination of phorate 10 G @ 1.5 kg ai/ ha as basal application with two foliar sprayings of cypermethrin 25 EC @ 0.005% after 45 and 60 days of sowing, phorate and combination with two sprayings either of cypermethrin @ 0.005% or methyl-0-demeton @ 0.03% at an interval of 45 and 60 days after sowing and phorate + two sprayings of endosulfan @ 0.05 % after 45 and 60 days of sowing was found most effective treatment to minimizing the population of *A. biguttula biguttula, B. tabaci* and *H. armiger*a, respectively. However, basal application of phorate with two foliar sprayings of monocrotophos @ 0.05 % registered highest crop yield and it was as high as 1380.00 kg/ ha.

Key words : Sunflower, *Helicoverpa* armigera, *Amrasca biguttula biguttula, Bemisia tabaci*

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Sunflower (*Helianthus annuus* L.) is an important oilseed crop. Due to its wide adoptability, it is cultivated in all the major crop growing areas and seasons. In India, more than fifty insects species have been reported infesting sunflower crop of which some are like leaf defoliators, grasshopper, termites, various sucking insects like jassids, thrips, white fly and bugs etc. In U.P., sunflower is known to suffer heavy losses from ravages of termite and cutworm as soil insects, jassids, thrips, whiteflies as sucking insects and tobacco caterpillar, Bihar hairy caterpillar and capitulum borer as defoliators. Since the unilateral and indiscriminate use of hazardous chemical pesticides result in alarming resistance in insect pest, their resurgence, elimination of friendly parasitoids, pollinators and insecticidal residues in food chain system causing significant human hazard. Therefore, there is dire need to develop such management strategies, which are environmentally safe, economically viable and socially acceptable. Keeping this view, the present study was undertaken to study the investigation on management of major insect pests of sunflower.

MATERIALS AND METHODS

The present investigation on insecticidal trial against major insect pests (jassid, white fly and capitulum borer) of sunflower (cultivar Modern) was undertaken during the two consecutive years *i.e.* 2005-06 and 2006-07 in summer season.

Experimental field trial was laid out in an area of one acre. In order to pesticidal schedules two sets were used having phorate as basal treatment @ 1.5 kg a.i./ha with two foliar sprayings of methyl-o-demeton 25 EC (0.03 per cent), endosulfan 35 EC (0.05 per cent), monocrotophos 36 SL (0.05 per cent), cypermethrin 25 EC (0.005 per cent), neemazal 10 EC (0.5 per cent) and bio-lep (0.5 per cent) after 45 and 60 days of sowing. In second set, same insecticides and bio-pesticides were applied singly on sunflower crop after 30, 45 and 60 days of sowing for observing their individual performance to control the pests and their effectiveness in comparison to various used combinations. For assessment of the effectiveness of control schedules, data were recorded on pest incidence after 72 hours of the final treatment in case of jassid and white fly. Percentage damage done by capitulum borer, the efficacy of insecticide spray, the percentage of damaged and healthy flowers were evaluated up to maturity of sunflower crop. In last, the yield was also recorded.

RESULTS AND DISCUSSION

The results obtained from the present investigation are summarized below :

Insecticidal trials against major insect pests of sunflower:

Jassid (*Amrasca biguttula biguttula* Ishida):

It is apparent from Table 1 that in both the years, the combination of phorate 10 G @ 1.5 kg ai/ha basal application with two foliar sprayings of cypermethrin 25 EC @ 0.005 per cent after 45 and 60 days of sowing was found to be most effective in minimizing the jassid attack. Interestingly, basal application of phorate with two sprayings of endosulfan 35 EC @ 0.05 per cent at same interval was also found at par with the earlier treatment. Both of these insecticides were closely followed the soil application of phorate by two foliar sprayings of methyl-o-demeton, monocrotophos, neemazal or biolep at 45 and 60 days after sowing of sunflower. Three sprayings of monocrotophos and methyl-o-demeton proved significantly superior over other insecticides when applied alone. It may also inferred from Table 1 that three alone spraying of endosulfan, cypermethrin and neemazal were next in order of efficacy and found non significant among themselves. They manifested the jassid population to the tune of 6.66, 6.75 and 6.82 per plant, respectively. Biolep gave significant poor performance against this pest. Mathur (1998) also reported that monocrotophos @ 1.0 lit/ha resulted 73.02 per cent mortality of jassid on sunflower followed by endosulfan 1.5 lit/ha (68.27 per cent mortality of jassid) and both the insecticides were statistically at par with each other. Mandal *et al.* (2007) also reported similar results in okra.

Table 1 : Effect of insecticidal schedules against *Amrasca biguttula biguttula* Ishida

Sr. No.	Treatments	Jassid population/ plant	
		Summer 2006	Summer 2007
T_1	Phorate + Methyl-o-demeton	3.3	3.1
T_2	Phorate + Endosulfan	2.76	2.85
T_3	Phorate + Monocrotophos	4.5	4.66
T_4	Phorate + Cypermethrin	2.43	2.20
T_5	Phorate + Neemazal	5.02	4.93
T_6	Phorate + Biolep	5.62	5.33
T_7	Methyl-o-demeton	6.51	6.31
T_8	Endosulfan	6.66	6.82
T_9	Monocrotophos	6.32	6.0
T_{10}	Cypermethrin	6.75	6.61
T_{11}	Neemazal	6.82	6.76
T_{12}	Biolep	28.99	27.75
T_{13}	Control	30.4	28.8
	S.E. (M)±	0.218	0.240
	C.D. (P=0.05)	1.97	1.68

White fly (*Bemisia tabaci* Genn.):

It is evident from Table 2 that soil application (basal treatment) of phorate 10 G @ 1.5 kg ai/ ha in combination with two sprayings either of cypermethrin 25 EC @ 0.005 % or methyl-o-demeton 25 EC @ 0.03 % at an interval of 45 and 60 days after sowing were found most effective in checking the white fly incidence, though they did not differ significantly among themselves and elicited 1.02 and 1.34 whiteflies/ leaf, respectively. It was closely followed by the basal application of phorate with two sprayings of endosulfan when applied at an interval of 45 days during 2006. During later year, soil application of phorate with two sprayings either of cypermethrin after 45 and 60 days or phorate in combination of monocrotophos at similar intervals were found most effective in suppressing population of *B. tabaci.* Both were closely followed by basal application of phorate with two sprayings of methyl-o-demeton or two sprayings of endosulfan at an interval of 45 and 60 days were found effective against *B. tabaci*. The findings of Singh *et al.* (1998) are in alignment with present results where basal application of phorate with two sprayings of cypermethrin followed by the basal use of phorate with the combination of two sprayings of methyl-o-demeton was quite effective to combat the attack of *B. tabaci* on sunflower. Das and

Table 2 : Effect of insecticidal schedules against *Bemisia tabaci* Genn

Sr. No.	Treatments	Whitefly population/ leaf	
		Summer 2006	Summer 2007
T_1	Phorate + Methyl-o-demeton	1.34	1.22
T_2	Phorate + Endosulfan	2.42	2.10
T_3	Phorate + Monocrotophos	1.42	1.12
T_4	Phorate + Cypermethrin	1.02	0.80
T_5	Phorate + Neemazal	2.52	2.21
T_6	Phorate + Biolep	3.39	3.15
T_7	Methyl-o-demeton	3.36	3.33
T_8	Endosulfan	3.42	3.21
T_9	Monocrotophos	2.81	2.25
T_{10}	Cypermethrin	2.97	2.33
T_{11}	Neemazal	7.75	6.83
T_{12}	Biolep	17.58	15.97
T_{13}	Control	19.0	17.0
	S.E. (M)±	0.174	0.77
	C.D. (P=0.05)	0.359	0.365

Panjikar (2009) also reported similar results in tomato.

Capitulum borer (*Helicoverpa armigera* Hubner):

It is evident from Table 3 that basal application of phorate + two sprayings of endosulfan after 45 and 60 days of sowing rendered 0.2 borer/ plant was found significantly superior over other treatments. It was closely followed by the basal application of phorate with two sprayings of monocrotophos which received damage to the tune of 0.48 borer/ plant. Similarly another effective treatment was basal application of phorate + two sprayings of biolep. This combination also proved significantly superior to rest of the treatments. Similar observations were recorded when three sprayings of endosulfan and neemazal alone were employed and registered 1.18 and 1.28 borers/ plant, respectively in the year 2006. Almost similar results have also been recorded to reduce the population of capitulum borer (*H. armigera*) in 2007 on summer season sunflower in central plain zone of U.P. The results corroborate with the present findings as reported by Naik *et al.* (2008). Chaudhari *et al*. (2008) also reported similar results on cotton.

Table 3 : Effect of insecticidal schedules against *Helicoverpa armigera* Hubner

Sr. No.	Treatments	Capitulum borer population/ plant	
		Summer 2006	Summer 2007
T_1	Phorate + Methyl-o-demeton	0.94	0.91
T_2	Phorate + Endosulfan	0.20	0.24
T_3	Phorate + Monocrotophos	0.48	0.50
T_4	Phorate + Cypermethrin	0.83	0.86
T_5	Phorate + Neemazal	0.99	0.99
T_6	Phorate + Biolep	0.65	0.70
T_7	Methyl-o-demeton	1.29	1.33
T_8	Endosulfan	1.18	1.22
T_9	Monocrotophos	1.33	1.29
T_{10}	Cypermethrin	1.10	1.20
T_{11}	Neemazal	1.28	1.30
T_{12}	Biolep	1.40	1.40
T_{13}	Control	4.1	3.5
	S.E. (M)±	0.655	0.076
	C.D. (P=0.05)	0.134	0.156

Effect of insecticidal application on the yield of sunflower:

In summer sunflower crop during 2006, basal application of phorate with two sprayings of monocrotophos registered the highest crop yield and it was as high as 1380.00 and 1362.500 kg/ha (Table 4). Although it was found at par when compared with phorate + biolep, phorate + endosulfan, phorate + methyl-o-demeton and phorate with two sprayings of cypermethrin in the summer sunflower and these treatments manifested the yield of crop to the tune of 1375.500, 1370.100, 1336.500 and 1331.500 kg/ ha, respectively which was statistically nonsignificant among themselves. Remaining treatments responded intermediary on the crop yield which ranged from 980.500 to 1000.00 kg/ ha when were used alone. Phorate + two sprayings of any tested insecticides in present investigation on the yield of sunflower in 2007 too, it was effective in which two sprayings of bacterial formulation was done. Biolep registered highest yield of 1365.500 kg/ ha. No doubt it was found statistically at par with monocrotophos or endosulfan, methyl-o-demeton and cypermethrin. The performance of rest of the alone sprayings of used insecticides noticed their poorer performance regarding total yield of sunflower. Kumar *et al*. (2008) also found highest grain yield from oxy-demeton methyl @ 0.025 % treatment which was due to effective control of linseed bud fly.

Table 4 : Effect of insecticidal schedules on yield of summer sunflower

Sr. No.	Treatments	Yield (kg/ ha)	
		Summer 2006	Summer 2007
T_1	Phorate + Methyl-o-demeton	1336.500	1318.500
T_2	Phorate + Endosulfan	1370.100	1355.100
T_3	Phorate + Monocrotophos	1380.00	1362.500
T_4	Phorate + Cypermethrin	1331.500	1315.200
T_5	Phorate + Neemazal	1185.00	1182.00
T_6	Phorate + Biolep	1375.500	1365.500
T_7	Methyl-o-demeton	1001.35	980.500
T_8	Endosulfan	975.100	900.00
T_9	Monocrotophos	940.00	925.00
T_{10}	Cypermethrin	935.00	880.00
T_{11}	Neemazal	995.00	940.00
T_{12}	Biolep	1050.00	1000.00
T_{13}	Control	685.500	663.500
	S.E. (M)±	79.82	64.05
	C.D. (P=0.05)	232.88	186.95

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