

Influence of cultural practices on infestation of fennel seed wasp (*Systole albipennis* Walker)

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Abstract

Fennel seed wasp (*Systole albipennis* Walker) is one of the most important pest of fennel crop that infest the seed at field stages and also found during storage. This is an important quarantine pest of seed spice crops. Management of seed wasp in fennel crop using agronomical manipulation of intercropping with other crops and using different dates of sowing to suppress the intensity of infestation of seed wasp *S. albipennis* (Walker) showed that with change of sowing date and intercropping with other crop significantly reduce the pest infestation on fennel. Sowing of fennel crop on 1st September and 15th September recorded maximum reduction in seed damage. Inter cropping of fennel with dill in ratio of 2:1 was found most effective to prevent the crop from seed wasp damage.

Key words: fennel, *S. albipennis*, Seed Spices

Introduction

Seed spice crops are mostly cultivated in the arid and semi arid regions of India during *rabi* season. Most of seed spices belongs to family *Apiaceae*, among these. Fennel is one of the important crop. It is cultivated in Rajasthan, Gujarat, Karnataka, Maharashtra, Punjab and Bihar but major producing states are Gujarat and Rajasthan (Meena *et al.*, 3). The fennel crop is attacked by various insect pests in the field as well as during storage. Chalcid wasp (*Systole albipennis* Walker) is specific pest of coriander, fennel and other seed spice crops, which has been earlier reported from Asia, Africa and Europe. The larva damages the fruit and survives in them. Infestation occur at field level and get carried with seed to the storage condition (Nagy and Marzso, 5 and Kant *et al.*, 1). The egg laid by female wasp hatches and developing larva feeds upon the seed and destroys the embryo and/or endosperm consequently. Approximately a damage of 40 percent in fennel (*Foeniculum vulgare* Mill.), 35 percent in carrot (*Daucus carota* L.), 30 percent in coriander (*Coriandrum sativum* L.), 27 percent in dill (*Anethum graveolens* L.), 20 percent in cumin (*Cuminum cyminum* L.) and 10 percent in ajwain (*Trachyspermum ammi* Sprague) seed was reported by this pest (Mittal and Butani, 4). The seed damage significantly reduces the market value of fennel, which is also one of the major constraints for quality seed production. Presence of immature stages of chalcid wasp in seed affect export also as it is important quarantine pest (Verma, 8). Female adults after inserting

its ovipositor through the fruit wall lays eggs in between the pericarp and ovule in the developing fruits under field conditions. At this stage, mericarps contains partially or cellular endosperm filamentous or globular preembryo and further with the concurrent development of growth of the ovary, endosperm and the embryo. Larvae complete its whole instars inside the seed and turn in pupae. Adult emerge out by making exit hole in the seed. They complete their life span within 25 days from egg to adults' stage (Mittal and Butani, 4). The immature stages present inside the seed after harvest emerges at variable time in storage condition and takes two to three months or even more.

Materials and methods

Two year field experiment on management of Eurytomid wasp *S. albipennis* (Walker) was conducted employing different agronomical practices at field experiment farm of NRC on Seed Spices, Ajmer (Rajasthan), during *rabi* season of 2011-12 and 2012-13. Fennel variety Ajmer Fennel-1 was selected for the study and the crop was sown on different dates, crop geometry and intercropping pattern with other crops. Fennel crop was sown in five different sowing dates at 15 days intervals starting from 1st September. Intercropping of fennel with dill (*Anethum graveolens*), mustard (*Brassica juncea*) and maize (*Zea mays*) in ratio of 2:1 and 3:1 was used to protect the crop against the pest. Dill and mustard was sown along with fennel (1st September), where as maize was late sown during first week of January. The

experiment was carried out in RBD design and replicated thrice with the plot size of 4.5 x 3 m. All recommended practices were followed to raise the good crop and any insecticide /botanical was not applied till maturity of crop. Average number of total seed and damaged seeds/umbel were recorded in five selected plant in each replication. Thus percentage of seed damage by wasp was worked out. The seed yield of crop at harvest was also recorded to compare the treatment effect. The details of the treatments are given in table 1.

Table 1: Intercropping/Barrier crops to suppress seed wasp incidence.

Treatments	Intercropping Pattern
1	Fennel + Dill (2:1)
2	Fennel + Mustard (2:1)
3	Fennel + Maize (2:1)
4	Fennel + Dill (3:1)
5	Fennel + Mustard (3:1)
6	Fennel + Maize (3:1)
7	Sole Crop

Result and discussion

Two years field experiment on agronomical manipulation of crop employing fennel crop intercropped with other crops and different date of sowing showed variable level of seed infestation with *S. albipennis*. In case of different date of sowing of fennel, average total seed/umbel was decreased as the date of sowing was delayed from 1st September. Highest number of average total seed/umbel (1210) was found in the treatment of crop sown at 1st September which was significantly superior over other dates of sowing. Whereas maximum total seed damage was recorded significantly higher in

the treatment of crop sown at 15th October. Per cent damage of seed by wasp was recorded minimum in crop sown at 1st September (2.4%) followed by crop sown at 15th September (2.9 %) which was statistically at par. Maximum seed damage of 6.0% was recorded in the crop sown at 15th October. The yield of crop at harvest showed that crop sown at 15th September gave maximum yield (19.7 q ha⁻¹) and was at par with 1st September sowing (Table 2). Similarly, Kant *et al.*, (2) recorded maximum damage of seed wasp in coriander crop sown on 15th October. Maximum yield of crop was also recorded on 15th October sowing. Patel *et al.*, (6) observed maximum infestation of *S. albipennis* on fennel crop in Gujarat state in the month of March and minimum in January. Fennel crop intercropped with other crop to protect from seed wasp damage showed no significant differences for average total seed/umbel in fennel crop. However, maximum seed/umbel was recorded in the treatments of fennel intercropped with mustard at ratio of 3:1. The average damage of seed/umbel was observed minimum in intercropping of fennel and with dill in ratio of 2:1 and was at par with fennel intercropped with mustard and dill in ratio of 2:1 and 3:1. The percent damage of seed at harvest was minimum with intercropping of fennel: dill in ratio of 2:1 (4.4%) and was at par with fennel: dill 3:1 ratio. The highest yield of fennel 11.8 q/ha was obtained in sole fennel crop and was at par with intercropping of fennel: maize and fennel: Dill both at 2:1 and 3:1 ratio (Table 3). Singh and Basawana (7) reported the infestation of *S. albipennis* in coriander on number and weight basis which varied from 1.5 to 28.3 and 1.8 to 17.7 percent, respectively in different varieties of coriander. Thus, in the management of fennel seed wasp optimum date of sowing and intercropping with dill seems to be an effective cultural operation.

Table 2: Effect of different Sowing Date on Seed Wasp damage and Yield

Treatments	Total Seed Umbel ¹			Damage Seed umbel ¹			% Damage			Yield (Q ha ⁻¹)		
	2012-13	2013-14	Average	2012-13	2013-14	Average	2012-13	2013-14	Average	2012-13	2013-14	Average
1 1 st Sep.	1468.9	1113.15	1291.0	12.33	43	27.7	0.84	3.86	2.4	18.8	20.0	19.4
2 15 th Sep.	1024.4	1207.8	1116.1	8.61	61	34.8	0.84	5.05	2.9	18.9	20.6	19.7
3 30 th Sep.	664.9	948.5	806.7	14.8	50	32.4	2.2	5.27	3.7	12.7	14.8	13.7
4 15 th Oct	742.4	669.6	706.0	18.56	64	41.3	2.5	9.55	6.0	12.1	12.3	12.2
5 30 th Oct.	597.2	450.2	523.7	11.64	30	20.8	1.94	6.67	4.3	11.9	9.8	10.9
SEM	36.44	38.13	37.09	0.60	2.33	1.45	0.08	0.31	0.19	0.63	0.66	0.65
CD @ 5%	118.85	124.36	120.96	1.95	7.60	4.73	0.27	1.00	0.63	2.07	2.17	2.11

Table 3: Effect of Inter Cropping (Barrier Crops) on Incidence of Seed Wasp and Yield

S.No.	Treatments	Total Seed Umbel ¹			Damage Seed umbel ¹			% Damage			Yield (Q ha ⁻¹)		
		2012-13	2013-14	Average	2012-13	2013-14	Average	2012-13	2013-14	Average	2012-13	2013-14	Average
1	Dill (2:1)	643.00	742.30	692.7	20.49	43.00	31.7	3.18	5.70	4.4	9.85	11.1	10.48
2	Mustard (2:1)	369.00	762.20	565.6	16.66	47.00	31.8	4.5	6.2	5.4	7.1	8.8	7.95
3	Maize (2:1)	617.00	730.40	673.7	31.74	70.00	50.9	5.1	9.6	7.4	10.3	13.23	11.77
4	Dill (3:1)	544.00	787.80	665.9	17.95	50.00	34.0	3.3	6.3	4.8	10.6	11.2	10.90
5	Mustard (3:1)	654.00	739.30	696.7	39.83	68.00	53.9	6.1	9.1	7.6	9.4	10	9.70
6	Maize (3:1)	632.00	641.40	636.7	48.66	70.00	59.3	7.7	10.9	9.3	10.9	12.3	11.60
7	T7 Sole	526.00	613.80	569.9	25.41	67.56	46.5	4.8	11.0	7.9	10.8	12.8	11.80
	SEM	27.02	31.90	29.30	1.77	3.00	2.37	0.29	0.45	0.37	0.46	0.53	0.49
	CD @ 5%	83.26	98.28	90.27	5.44	9.24	7.30	0.90	1.37	1.13	1.42	1.63	1.53

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Received : January 2015; Revised : April 2015;
Accepted : June 2015.