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Impact of sowing periods on incidence of aphid, *Hyadaphis coriandri* (Das) infesting fennel

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Abstract

Five sowing periods during winter (2nd week of October, 3rd week of October, 4th week of October, 1st week of November and 2nd week of November) was evaluated for its impact on incidence of aphid, *Hyadaphis coriandri* (Das) infesting fennel at Agronomy Instructional Farm, C. P. College of Agriculture, S. D. Agricultural University, Sardarkrushinagar. Among all the sowing periods, the first two sowing periods viz., 2nd and 3rd week of October sown crop suffered less damage caused by aphid attack, whereas remaining last two sowing periods viz., 1st and 2nd week of November harboured more aphid incidence. Among the five different sowing periods, the maximum seed yield was recorded from 2nd week of October sown crop (14.75 q/ha). The lowest seed yield was recorded when the fennel sown during 1st week of November.

Keywords: Sowing periods, aphid and fennel

Introduction

India is known as the 'Land of Spices' as foreign invaders invaded India for spices in ancient times. Vasco De Gama learned that the perilous maritime route to India is solely used for spice commerce (Sastry and Sharma, 2001) ^[1]. Fennel (*Foeniculum vulgare* L.) is a large seed spice crop that is generally known as "Saunf" or "Badi saunf" or as "Variyali" in Gujarat. It belongs to the Apiaceae family and is native to Southern Europe and the Mediterranean area. India is the world's largest producer and consumer of fennel, accounting for around 26% of total output. Mexico is the second-largest producer, followed by China and Iran. The world fennel yield is projected to be between 4 and 4.15 lakh tonnes. In India, the fennel area was 65000 hectares, with a production of 115000 MT in 2021-22 (Anon., 2022) ^[2]. Gujarat, Rajasthan, Karnataka, Andhra Pradesh, Punjab, Haryana, Madhya Pradesh, and Uttar Pradesh are the top fennel-producing states in India. Gujarat leads the way in both domestic and international output and productivity. Fennel is a long-lasting cold-weather seed spice crop grown in the country's dry and semi-arid areas. It is cultivated throughout the *kharif* and *rabi* seasons in Gujarat. It is mostly farmed for its seeds. Gujarat ranks top with 41957 ha of land area, 87173 MT of output and a productivity of 2.08 MT/ha in 2021-22, accounting for 82% of total production in India (Anon., 2022) ^[2]. The production of fennel is affected by various pests including insect- pests like aphid: *Hyadaphis coriandri* (Das), thrips: *Thrips flavus* (Schrank); *Thrips tabaci* (Lindeman); *Scirtothrips dorsalis* (Hood), whitefly: *Bemisia tabaci* (Genn.), leaf eating caterpillar/gram pod borer: *Helicoverpa armigera* (Hubner) Hardwick, seed midge: *Systole albipennis* (Walker); *Systole coriandri* (Gussakovsky), cutworm: *Agrotis segetum* (Denis) & *Agrotis ipsilon* (Hufnagel), brown wheat mite: *Pterobia latens* (Muller), pentatomid bug: *Calcoris noregicus* (Fabricius), lygus bugs: *Lygus* spp., cigarette beetle: *Lasioderma serricornis* (Fabricius), and drug store beetle: *Stegobium paniceum* (Motschulsky), diseases like leaf blight: *Ramularia foeniculi* (Sibilia), leaf spot: *Cercosporidium punctum* (Deighton), damping off: *Pythium aphanidermatum* (Edson), wilt: *Fusarium equiseti* (Corda), powdery mildew: *Erysiphe polygoni* (DC/ E. heraclei) and nematodes (root-knot nematode: *Meloidogyne* spp.) (Anon., 2014) ^[1]. Among the several pests, the aphid, *H. coriandri* causes the most harm to the fennel crop because both nymphs and adults drain cell sap from leaves, stems, and umbels, causing the plant to become weak and stunted. Furthermore, it emits enormous amount of honeydew, which

promotes the formation of sooty mould and slows the growth of the plant. In severe infestations, the growth tips and flower stalks wither and dry up, and the seeds do not develop throughout the blooming and fruiting stages, or if they do, they are shriveled and of poor quality (Kant *et al.*, 2022) [6]. Mittal and Butani (1989) [7] found fennel seed losses of up to 903 kg/ha, accounting for 50% of crop losses in Gujarat, and it is regarded as a significant or important pest of fennel that poses a danger to seed spices in Gujarat conditions. Natural enemies including coccinellid predators (*Coccinella septempunctata* Linnaeus and *Menochilus sexmaculatus* Fabricius), syrphids, spiders and chrysopids are rich in the fennel ecosystem (Kanjiya *et al.*, 2018) [5]. In the present scenario, effective management techniques other than insecticidal application against the pest are not available. Under these circumstances, it becomes necessary to find out some eco-friendly alternative methods for insect-pest management which include the manipulation of the cultural practices like deviating the period of sowing. Secondly day by day, organic farming as well as natural farming is gaining the importance where one can not use chemical insecticides (Pathan *et al.*, 2022) [9, 10]. Keeping these points in view, detail investigations were undertaken to observe the impact of sowing periods on incidence of aphid, *Hyadaphis coriandri* infesting fennel.

Materials and Methods

With a view to examine the effect of sowing periods on infestation of aphid in fennel, an experiment was laid out during *rabi*, 2023-24 at Agronomy Instructional Farm, C. P. College of Agriculture, S. D. Agricultural University, Sardarkrushinagar. Fennel variety GF 1 was grown in a gross plot of 3.6 m × 6 m with Net plot size of 2.4 m × 5.4 m at 60 cm × 30 cm spacing in a Randomized Block Design with four replications at five different periods of sowing *i.e.*, 2nd week of October, 3rd week of October, 4th week of October, 1st week of November and 2nd week of November. All the recommended agronomical practices were adopted to raise the crop. From each sector, 10 plants were selected randomly to count the insect pests population. The data obtained were correlated with abiotic factors. The observations on population of aphids was recorded at weekly interval, starting from one week after germination to the harvest of crop. The population of aphid was estimated by adopting zero to four indexes through the observations made on 10 cm terminal twigs of ten randomly selected plants. The following indices were suggested by Patel *et al.* (2011) [8] for estimation of aphid population.

Indices Description

Aphid index 0: Plants free from aphids

Aphid index 1: Aphid present but colonies are not build up

Aphid index 2: Presence of small colonies of aphids

Aphid index 3: Large colonies of aphids present on tender parts (counting of the aphid colonies is possible tender plant parts show the damage symptoms due to aphids)

Aphid index 4: Entire plants covered by aphids (counts of aphids in colonies is impossible and plants shows the damage symptoms due to aphid) and finally plant dies

$$\text{Average aphid index} = \frac{0N + 1N + 2N + 3N + 4N}{\text{Total no. of plants observed}}$$

Where,

0, 1, 2, 3 and 4 are aphid index

N = Number of plants showing respective aphid index

Results and Discussion

The periodical data on aphid index are presented in Table 1. The study revealed marked difference in aphid incidence as regards of different sowing periods. At 9th WAG aphids were not observed in the crop sown during 2nd week of October, 3rd week of October, 4th week of October and 1st week of November sown crop. At 11 weeks after germination indicated that there was no any aphid recorded in crop sown in 2nd week of October, 3rd week of October and 4th week of October. At 13 weeks after germination the crop sown early *i.e.* 2nd week of October exhibited significant impact with 1.30 aphid index in fennel in comparison to rest of the treatments of sowing periods. Data recorded at 15 weeks after germination highlighted that impact of sowing periods was significant. The crop sown early *i.e.* 2nd week of October exhibited significant impact with 1.42 aphid index in fennel in comparison to rest of the treatments of sowing periods. At 17 weeks after germination fennel crop sown during 3rd week of October (1.61 A.I.), 4th week of October (1.63 A.I.) and 1st week of November (1.66 A.I.) showed moderate level of aphid incidence. At 22 weeks after germination, significantly highest aphid infestation was revealed in the crop sown during 2nd week of November (2.32 A.I.). Data recorded at 23 weeks after germination showed highest aphid infestation was revealed in the crop sown during 2nd week of November (2.15 A.I.). Similarly, significantly highest aphid infestation was revealed in the crop sown during 2nd week of November (2.03 A.I.) at 24 week after germination.

Pooled over periods (Table 1) calculated for the year 2023-24 indicated that least infestation (1.13 A.I.) of aphid to fennel crop was observed in the crop sown during 2nd week of October. This treatment proved significantly superior over rest of the treatments by exhibiting low level of infestation. The crop sown during 3rd week of October and 4th week of October exhibited 1.29 and 1.33 aphid index, respectively. On the other hand fennel crop sown late *i.e.* 2nd week of November showed significantly highest aphid counts (2.07 A.I.) followed by the crop sown during 1st week of November (1.53 A.I.). The data clearly indicated that the crop sown during first fortnight of October exhibited low level of aphid, *H. coriandri* infestation and increased in subsequent weeks.

Hake *et al.* (2018) [4] noticed that early sown (20th October) fennel crop exhibited minimum (57.60 aphids/ plant) aphid population, whereas late sown (30th November) crop showed maximum (118.30 aphids/ plant) population of aphids. Faragalla and Hassan (2018) [3] studied the impact of planting dates on aphid infestation level in fennel and reported the higher incidence of this pest in 15th November (156.77 aphids/plant) and 1st December (170.97 aphids/plant) sown crop. These reports are in line with present findings. The late sown (5th December) cumin crop received higher aphid, *Myzus persicae* infestation, while early sown crop (25th October) received minimum aphid infestation (Yadav *et al.*, 2018) [12]. These reports are in conformity with the present finding.

Impact of date of sowing on seed yield of fennel

During the year 2023-24, the fennel crop grown by direct seeding method (Table 2). Of the evaluated sowing periods, the highest (14.75 q/ha) seed yield was recorded from 2nd week of October sown fennel crop. The last sowing period *i.e.* 1st week of November produced significantly the lowest (8.39 q/ha) yield

of fennel than all the evaluated periods followed by 2nd week of November (8.51 q/ha).

Hake *et al.* (2018) [4] mentioned that the maximum (12.65 q/ha) seed yield of fennel was recorded from 30th October sown crop and remained at par with the crop sown on 20th October (12.48 q/ha). The minimum seed yield (8.25 q/ha) was obtained from

the late sown (30th November) fennel crop. According to Faragalla and Hassan (2018) [3] 15th October and 1st November sown fennel crop had higher (859 and 880 q/ha) seed yield as compared to late sown crop. These reports are more or less in agreement with present findings.

Table 1: Impact of sowing period on population of aphid infesting fennel

Sr. Number	Treatments	Aphid Index at indicated Week After Germination															Pooled over periods	
		9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24
D ₁	2 nd week of October	0.00	0.00	0.00	0.00	1.30	1.38	1.42	1.47	1.52	1.56	1.67	1.76	1.72	1.50	1.40	1.33	1.13
D ₂	3 rd week of October	0.00	0.00	0.00	1.35	1.40	1.46	1.53	1.53	1.61	1.63	1.72	1.77	1.85	1.69	1.62	1.54	1.29
D ₃	4 th week of October	0.00	0.00	0.00	1.40	1.47	1.52	1.55	1.61	1.63	1.71	1.77	1.89	1.86	1.70	1.63	1.55	1.33
D ₄	1 st week of November	0.00	1.39	1.41	1.44	1.50	1.54	1.59	1.63	1.66	1.77	1.80	1.92	1.88	1.73	1.65	1.58	1.53
D ₅	2 nd week of November	1.69	1.74	1.77	1.79	1.82	1.85	1.97	2.06	2.18	2.32	2.42	2.55	2.44	2.32	2.15	2.03	2.07
S. Em. ±	T (Treatment)	0.02	0.05	0.04	0.07	0.10	0.10	0.09	0.11	0.11	0.09	0.13	0.12	0.12	0.12	0.12	0.09	0.03
	P (Period)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.04
	T×P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.09
C. D. at 5%	T	0.08	0.14	0.13	0.22	0.29	0.30	0.28	0.34	0.33	0.28	0.41	0.37	0.38	0.36	0.38	0.28	0.07
	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.12
	T×P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.27
	C. V. (%)	14.69	14.94	12.99	12.07	12.77	12.77	11.16	13.39	12.40	10.20	14.28	12.13	12.53	13.15	14.55	11.46	13.53

Table 2: Impact of sowing periods on seed yield of fennel

Sr. Number	Treatments	Seed yield (q/ha)
D ₁	2 nd week of October	14.75
D ₂	3 rd week of October	11.63
D ₃	4 th week of October	11.88
D ₄	1 st week of November	8.39
D ₅	2 nd week of November	8.51
S. Em. ±	(Treatment) T	0.76
	(Period) P	-
	(Spray) S	-
C.D. at 5%	T	2.34
	P	-
	S	-
	C. V. %	13.79

Conclusion

Among all the sowing periods, the first two sowing periods *viz.*, 2nd and 3rd week of October sown crop suffered less by aphid attack, whereas remaining last two sowing periods *viz.*, 1st and 2nd week of November harboured more aphid incidence. Among the five different sowing periods, the maximum seed yield was recorded from 2nd week of October sown crop (14.75 q/ha) because in 2nd week of October sown crop no any aphid observed till 12th week after germination.

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