

Pest scenario of cumin (*Cuminum cyminum* L.) and population dynamics in semi-arid region of Rajasthan

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Abstract

A field investigation on pests scenario of cumin (*Cuminum cyminum* L.) was carried out in semi-arid region during *Rabi* season. It is revealed that cumin crop received an infestation of twelve pest species from different order and family. Two species of aphids, *Aphis gossypii* Glover and *Myzus persicae* Sulzer (Insecta: Hemiptera: Aphididae.), three species of thrips : *Thrips tabaci* Lind., *Scirtothrips dorsalis* and *Frankliniella schultzei* (Thysanoptera: Thripidae), one species each of jassid, *Empoasca* sp., seed bug (*Nysius* sp.), and whitefly, *Bemisia tabaci* Gen., were reported as pests of major status. The insects like red cotton bug, *Dysdercus koenigii*, sting bug, *Nezara viridula*, termite, *Odontotermes obesus* (Ramb), seed borer, *Hellula undalis* F., and grasshopper, *Acrida* sp. were reported as minor pests of cumin in the region. Tobacco caterpillar, *Spodoptera litura* Fab. (Lepidoptera: Noctuidae) was reported as occasional pest status on the crop. The maximum population for aphids (20.2 aphids plant⁻¹ or 87 aphids umbel⁻¹) was recorded over the cropping period, whereas remaining pests populations were found in ranged between 0.2 to 2.8 insects plants⁻¹ or umbel⁻¹.

Key words : *Cuminum cyminum*, insect-pests, population dynamics, semi-arid region.

Introduction

Cumin (*Cuminum cyminum* Linn.) is an annual herb (2n=14) belongs to the family Apiaceae. Its origin is considered to be Mediterranean region. It is mainly growing in India, Pakistan, Iraq, Iran, Turkey, China, Egypt, Syria, Israel and Italy. In India, cumin is a most important and valuable crop among all seed spices, largely cultivating in Gujarat, Rajasthan and Madhya Pradesh. It is growing in 8.08 lakh hectare area, producing 5.03 lakh tonnes of seeds with an annual productivity of India 623 kg ha⁻¹ in 2015-16 (Anonymous, 2016) reflecting as largest producer, consumer and exporter. Cumin is primarily used for giving *Tadka* in most of cooking vegetables to create special flavour. It is also used for flavouring, seasoning and imparting aroma in variety of food items and beverages. Besides importance in food industry, it has several medicinal properties used as stimulant, carminative, stomachic, astringent and constructive in diarrhea and dyspepsia (Malhotra and Vashishtha, 2008). The dried cumin seeds contain 2.5 to 4.5% volatile oil. Due to oleoresin and cuminaldehyde content, it has good demand in the international market.

Cumin plants are severely affected by diseases and insect pests, which are highly detrimental to its growth and yield. Among insect-pests, aphids (*Myzus persicae* and *Aphis gossypii*) and thrips (*Thrips tabaci*) are the major sucking insects which causes serious economic losses in cumin

(Dangi *et al.*, 2016). Jassids, *Empoasca* sp., whitefly, *Bemisia tabaci* (Gen.); seed borer, *Hellula undalis* (F.), seed bug, *Nysius* sp. (Meena, 2005) and other minor insects feed on crop and caused damage in different levels. Cumin aphid causes serious damage at flowering stage of the crop by yellowing and curling of leaves in the initial stage and later the plants show stunted growth and the inflorescences set a few seeds which are shriveled (Dangi *et al.*, 2016). The reported insect pests appear at different crop growth stages. In the absence of regular monitoring as well as suitable control measure on time, pest population exceeded above injury level, resulting significant loss in yield and quality. Keeping these in view a field experiments were carried out to state the diversity of insect-pests and their population dynamics on cumin in semi-arid region of Rajasthan.

Material and methods

Field trials were conducted at experimental farm, ICAR-NRCSS, Ajmer (A semi-arid region of Rajasthan) during 2013-14 and 2014-15 to study the diversity of insect-pests on cumin crop in *Rabi* season. The experimental site is located at latitude of 26° 27' 0" N and 74° 38' 0" E longitude having 460 meter msl altitude. The experimental location is surrounded by Aravalli hills, receives annual average rainfall 300-550 mm, temperature 2-5° C in January and 42-45° C in May-June and 60-80% relative humidity during the period of study.

Cumin, variety GC-4 was grown in well prepared and laid out field and recommended package of practices were applied for optimum growth of the plants. There was no plant protection measures applied for management of insect-pests on the crops. A regular field monitoring of insect pests were carried out to know the qualitative and quantitative pest status. The observations on insect pests of cumin were recorded at fortnightly intervals right from germination of the crop to disappearance of the pests. The population of aphid (scale: 01 aphid=10), thrips, jassid and whiteflies were recorded on 5 randomly selected and tagged plants in a plot. In early growth period, the whole plant was taken as a single unit and later on observations were recorded on three umbels of every tagged plant. All the stages of nymphs and adults of these pests were taken in to account while counting. The observations on others insects i.e., stink bug, painted bug, seed bug, red cotton bug, tobacco caterpillar, seed borer and grasshopper were recorded on visual counting on randomly selected and tagged five plant plot⁻¹. Observation on termite infestation as dried plants plot⁻¹ due to termite was recorded during the study period.

Results and discussion

The data on insect-pests complex of cumin were recorded and presented in table 1, revealed that, there were twelve insect species from different order and family were recorded on cumin crop in semi-arid region of Rajasthan during the study period. Among pest complex, thrips species *Thrips tabaci*, *Frankliniella schultzei* and *Caliothrips indicus* and jassids, *Empoasca* sp. were noticed on the cumin plants at 20 and 30 days after germination, respectively with meager in population. Aphids' species *Myzus persicae* Sulzer and *Aphis gossypii* Glover were initiated on cumin at three to four leaf stages, almost 30-45 days after germination and being active on crop throughout the cropping season categorized as major pest of cumin (Table 1). White fly (*Bemisia tabaci*) infestation was recorded on cumin plants 15 days after germination in 1 to 2 flies five plants⁻¹ and its population fluctuate up and down continued up to flowering stage. Grasshopper, *Acrida* spp. and termite (*Odontotermes obesus*) damage was recorded at early plant growth stage (25 to 30 days after germination) but some time termite damage was also noticed on full grown plants at harvest. Termite's workers damaged the crop by cutting the roots inside soil as resulted whole cumin plants were dried. The infestation of stink bug, *Nezara viridula* Linn., and red cotton bug, *Dysdercus koenighii* (Fab.) were observed on plants at fully grown stage (70 to 85 days after sowing), while painted bug *Bagrada hilaris* (Burm.) was recorded during

inception of flowering on cumin and was being active till seed maturation. Similarly, tobacco caterpillar, *Spodoptera litura* infestation was notice on cumin crop at initiation of flowering and continues till seed maturation. Seed borer, *Hellula undalis* damage was found in cumin field at seed formation stages and continued till maturation of crop in semi-arid conditions. A meager work was reported on management aspect particularly in cumin crop. However, the similar results were recorded on other crops viz., the infestation of sucking insects aphid (*Hyadaphis coriandri*, *Myzus persicae* and *Aphis gossypii*) and thrips on coriander was recorded at 15 to 45 days after germination (Meena *et al.*, 2017) are accordance with the present study. The similar observations were made by other worker that aphid, *Myzus persicae* (Araujo, 1986), *Aphis gossypii* (Singh and Baswana, 1984) were caused damage to coriander at different level get support the present findings. The pest occurrence and population level on cumin were also recorded and presented in figure 1, revealed that the sucking insects viz., thrips, aphids, jassids and whiteflies were appeared on crops in early growth stage in scanty population during November and December. Among these, thrips infestation was appeared in first week of November and after that its infestation fluctuates with an average population 2.8 thrips plant⁻¹. Whitefly infestation was also recorded on cumin in fourth week of October (15 days after germination) with an average 1.2 flies plant⁻¹. Aphid infestation initiated on cumin crops in second week of November with an average population 20.2 aphids plant⁻¹ in early plant growth stage. Later on, aphid population increased and reached to its maximum (87 aphids umbel⁻¹) during flowering to seed formation stage. Similarly, jassids infestation was appeared on crop in second week of November with an average population 2.6 jassids plant⁻¹ and continued till initiation of flowering. The sting bug infestation was recorded on cumin in first week of January at flowering initiation stage to maturity of crop with an average population was 1.4 bugs plant⁻¹. Seed bug and red cotton bug were reported in middle of January with average population 0.2 and 0.6 bugs plants⁻¹, respectively and infestation fluctuates up and down to their average population. Bugs infestation lasted up to harvesting of cumin crop. Its population was fluctuated more or less in number close to their average population, depending upon the various biotic and abiotic factors. Grasshopper's and termite damage was initiated on cumin in October (just after germination) and observed till harvesting of crops, however, an specific trend of infestation for both the insects was not followed. The other lepidopteran caterpillars, tobacco caterpillar (0.40 larvae

Table 1. Pest complex of cumin (*Cuminum cyminum* L.) in semi-arid region of Rajasthan

Sl. No.	Name of pests	Scientific name	Order and family	Pest status
1.	Aphid	<i>Myzus persicae</i> (Sulzer) <i>Aphis gossypii</i> Glover	Hemiptera: Aphididae	Major
2.	Thrips	<i>Thrips tabaci</i> Gen. <i>Frankliniella schultzei</i> Tryb. <i>Caliothrips indicus</i> Bag.	Thysanoptera: Thripidae	Major
3.	Jassids	<i>Empoasca</i> sp.	Hemiptera: Cicadellidae	Major
4.	Whitefly	<i>Bemisia tabaci</i> Genn.	Hemiptera: Aleurodidae	Major
5.	Stink bug	<i>Nezara viridula</i> (Linn.)	Hemiptera: Pentatomidae	Minor
6.	Seed bug	<i>Nysius</i> sp.	Hemiptera: Lygaeidae	Major
7.	Painted bug	<i>Bagrada hilaris</i> (Burm.)	Hemiptera: Pentatomidae	Minor
8.	Red cotton bug	<i>Dysdercus koenigii</i> Fab.	Hemiptera: Pyrrhocoridae	Minor
9.	Termite	<i>Odontotermes obesus</i> (Ramb)	Isoptera: Termitidae	Minor
10.	Tobacco caterpillar	<i>Spodoptera litura</i> (Fab.)	Lepidoptera: Noctuidae	Occasional pest
11.	Seed borer	<i>Hellula undalis</i> (F.)	Lepidoptera: Crambidae	Minor
12.	Grasshopper	<i>Acrida</i> spp.	Hemiptera: Acrididae	Minor

Insect-pests of coriander were enlisted based on visual observations

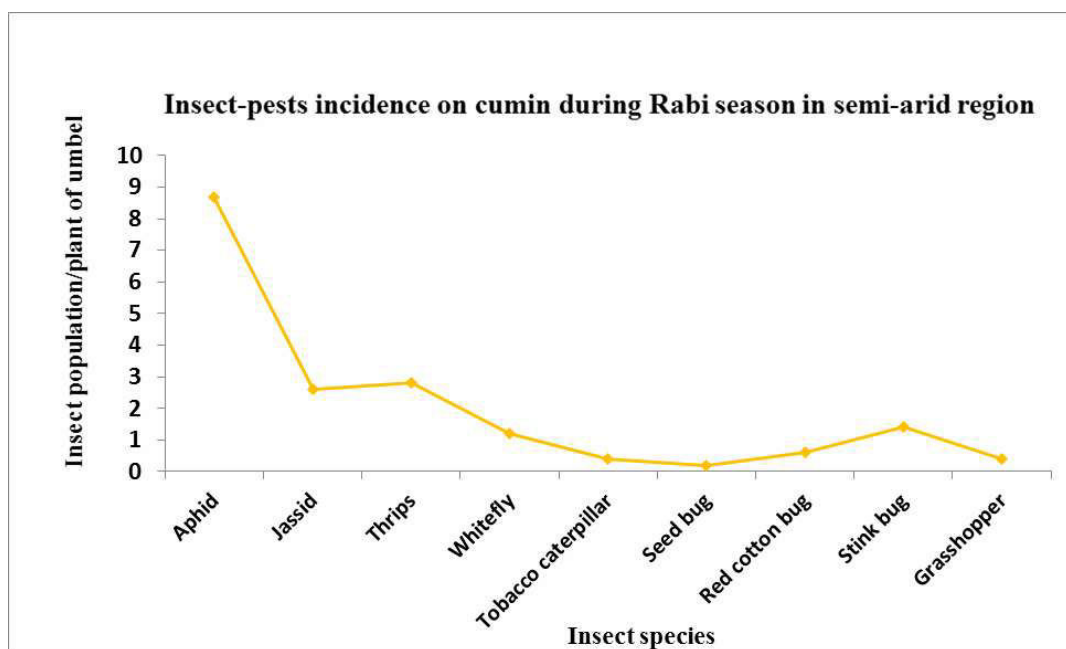


Fig. 2. Pest incidence on cumin in semi-arid region during *Rabi* season

plant¹) and leaf eating caterpillar (*Hellula undalis*) were also noticed on cumin crop during January-February however its population was very less in number in both the years.

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