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Biotic parameters of ladybird beetle, *Coccinella septempunctata* Linn. On aphid, *Rhopalosiphum maidis* (Fitch) of blond psyllium, *Plantago ovata* Forsk

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Abstract

The experiment was conducted at Sri Karan Narendra College of Agriculture, Jobner (Rajasthan) on blond psyllium, *Plantago ovata* Forsk., is one of the important medicinal crop grown in Gujarat and Rajasthan. Popularly known as 'Isabgol' (Family: Plantaginaceae). Out of about 200 species of psyllium available in various countries, only 10 are found in India. The blond psyllium is severely damaged by the aphid, *Rhopalosiphum maidis* (Fitch) through sucking of the cell sap which weakens the plants. The ladybird beetle, *Coccinella septempunctata* Linn. Has prime position among the predatory fauna of sucking insect pests, particularly aphids. The aphids, *R. maidis* were reared on twenty replicated blond psyllium plants which were covered with muslin cloth and one pair of freshly emerged adult of *C. septempunctata* was released in each. The different parameters of biotic potential observed, viz., pre mating period varied from 4 to 9 days, mating period 41 to 67 minutes, pre oviposition period 8 to 14 days, oviposition period 11 to 21 days, post oviposition period 4 to 8 days, fecundity 227 to 452/ female, hatchability 70 to 90 per cent, larvae changed to pupae 83.33 to 96.67 per cent and pupae changed to adults 86.67 to 96.33 per cent.

Keywords: Biotic potential, predator, *Coccinella septempunctata*, aphid

Introduction

Blond psyllium, *Plantago ovata* Forsk., known as 'Isabgol' (Family: Plantaginaceae) is one of the important medicinal crops grown in Rajasthan. Out of about 200 species of psyllium available in various parts of the globe, only 10 are found in India (Anonymous, 1969) [1]. The blond psyllium is known for superior quality of husk and is preferred to other species. The plant and its products are being used as herbal medicines from the time immemorial in China, Egypt and India for curing many kinds of ailments. The husk yields a colloidal mucilage consisting mainly of xylose, arabinose and galacturonic acid. It is also used for treating constipation and intestinal disorders because it works as a calorie free fibre food promoting regular bowel movement. The crop has also gained value due to blood cholesterol lowering property of its husks (Taneja *et al.*, 1989) [2]. The husk is exported largely to Afghanistan, Bahrain, Canada, Sri Lanka, U.A.E., Fiji, France, Kenya, Kuwait, Oman, Nepal, New Zealand, Saudi Arabia, Somalia, U.S.A., West Germany, U. K. and Zambia (Lal *et al.*, 2005) [7]. Due to high demand in the world market, the blond psyllium crop has acquired the status of 'dollar earner' in North Gujarat and South-Western Rajasthan (Modi *et al.*, 1974) [8]. Gujarat and near part of Rajasthan constitute major blond psyllium producing area. Jalore, Barmer and Jaisalmer districts are major producing districts of Rajasthan. The area and production of blond psyllium in the Rajasthan was 355320 hectares and 184728 tonnes, respectively; with an average productivity of 520 kg ha⁻¹ (Anonymous, 2017) [2].

The low productivity of the crop is attributed to the attack of insect pests and diseases. Among the insect pests causing major damage to blond psyllium crop are aphid, *Rhopalosiphum maidis* (Fitch), field cricket, *Gryllus* sp.; whitefly, *Bemisia tabaci* (Genn.); *Aphis gossypii* Glov, and field termites, *Odontotermes obesus* Rambur and *Microtermes obesi* Holmgren (Jindla *et al.*, 1984; Sagar, 1989; Farooqi and Sreeramu, 2001 and Kumawat, 2008) [5, 9, 3, 6]. The insect predators have received much less attention as natural control agents. The use of predators may prove to be better choice among various groups of bio-agents. The important predators, viz., ladybird beetles, *Coccinella septempunctata* Linn., *Menochilus sexmaculatus* Fab., *Adonia variegata* Goeze, *Brumoides suturalis* (Fab.); syrphid fly, *Xanthogramma scutellare* McIntosh and *Syrphus balteatus* (Degean) feed on aphids,

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whiteflies, mealy bugs, insect eggs and neonate larvae on different crops (Gautam, 1994) [4]. The ladybird beetle, *C. septempunctata* has prime position among the predatory fauna of sucking insect pests, particularly aphids. The biotic potential of this predator have been studied by some workers but needs further investigations for commercial promotion in augmentative trials. The study aimed in order to find out the biotic potential parameters. Suitable understanding of the biotic potential of ladybird beetle, *C. septempunctata* is important due to predator on aphid, *R. maidis* on the blond psyllium crop.

Materials and Methods

The biotic potential of predominant predatory species, *i.e.* *C. septempunctata* on locally prevailing blond psyllium aphid, *R. maidis* was studied of blond psyllium at Department of Entomology, Sri Karan Narendra College of Agriculture, Jobner, Rajasthan during *rabi*, 2007. The aphids were reared on twenty replicated blond psyllium plants which were covered with muslin cloth and one pair of freshly emerged adult of *C. septempunctata* was released in each. Observations were recorded for pre-mating and mating period, pre-oviposition, oviposition and post-oviposition period and fecundity of *C. septempunctata*. To study the hatchability (%), 30 eggs of a batch were transferred in each petri dish with ten replicates at room temperature. Hatchability was estimated after counting of hatched eggs. To find out pupation per cent, individual grubs were reared on aphid in petri dish

with thirty replications and then number of grubs changed to pupae were recorded. Per cent adult emergence was found out by calculating of pupae changed to adult; single pupa was kept in each petri dish with thirty replications. Sex ratio was estimated by proportion of female adult present in the overall population of the beetles.

Results

The different parameters of biotic potential, *viz.*, pre mating period (days), mating period (minutes), pre-oviposition period (days), oviposition period (days), post oviposition period (days), fecundity/ female, hatchability (%), pupation (%) and pupal survival has been recorded in table 1. The pre mating period varied from 4 to 9 days, mating period 41 to 67 minutes, preoviposition period 8 to 14 days, oviposition period 11 to 21 days, post oviposition period 4 to 8 days, fecundity 227 to 453/ female, hatchability 70 to 90 per cent, larvae changed to pupae 83.33 to 96.67 per cent and pupae changed to adults 86.67 to 96.67 per cent. Table 2 revealed the sex ratio of *C. septempunctata* collected from different agro-ecosystem, *viz.*, blond psyllium, *P. ovata*; mustard, *Brassica juncea*; coriander, *Coriandrum sativum* and fenugreek, *Trigonella foenum-graecum*. The sex ratio (Female /Male ratio) was highest in the sample collected from mustard crop (1.78), *vis- a-vis*, lowest in the blond psyllium (1.33). The female/male ratio in coriander and fenugreek crop was found in the middle order. The mean sex ratio of different agro-ecosystems was 1.51.

Table 1: Biotic potential of *Coccinella septempunctata* Linn.

Parameters	Observations	
	Range	Mean \pm S.E.
Pre mating period (days)*	4-9	6.55 \pm 0.29
Mating period (minutes)*	41-67	51.85 \pm 1.73
Pre oviposition period (days)*	8-14	10.05 \pm 0.37
Oviposition period (days)*	11-21	15.10 \pm 0.58
Post oviposition period (days)*	4-8	5.35 \pm 0.26
Fecundity /female*	227-453	339.75 \pm 15.20
No. of eggs hatched **	21-27	23.90 \pm 0.60
Hatchability (%)	70-90	79.67 \pm 2.02
No. of larvae changed to pupae***	25-29	27.20 \pm 0.21
Larvae changed to pupae (%)	83.33-96.67	90.66 \pm 0.70
No. of pupae changed to adults***	26-29	27.04 \pm 0.22
Pupae changed to adults (%)	86.67-96.33	92.67 \pm 0.73

* Mean of twenty observations

** Mean of ten observations (30 eggs in each replicate)

*** Mean of thirty observations

Table 2: Sex ratio of *Coccinella septempunctata* Linn.

S. No.	Adults collected from	Total No. of adults	No. of males	No. of females	Sex ratio (F:M ratio)
1	Research area of blond psyllium crop	100	43	57	1.33
2	Mustard crop at Agronomy farm	100	36	64	1.78
3	Coriander crop from plant breeding research area	100	42	58	1.38
4	Fenugreek crop at Agronomy farm	100	40	60	1.50
	Total	400	158	239	5.99
	Average	100	40.25	59.75	1.51

Discussion

Different parameters of biotic potential, *viz.*, pre mating period (days), mating period (minutes), pre-oviposition period (days), oviposition period (days), post oviposition period (days), fecundity/ female, hatchability (%), pupation (%) and pupal survival has been recorded in table -1. The pre mating period varied from 4 to 9 days, mating period 41 to 67 minutes, pre-oviposition period 8 to 14 days, oviposition

period 11 to 21 days, post-oviposition period 4 to 8 days, fecundity 227 to 453/ female, hatchability 70 to 90 per cent, larvae changed to pupae 83.33 to 96.67 per cent and pupae changed to adults 86.67 to 96.67 per cent. Sethi and Atwal (1964) [10] recorded 263 eggs (at 30^o C and 70% relative humidity) to 444 eggs (at 20^o C and 90% relative humidity) per female which partially corroborates with the above findings. Singh and Malhotra (1979) observed pre-

oviposition, oviposition and post-oviposition periods as 5.6, 13.3 and 2.8 days, respectively in laboratory conditions. Incubation period was reported to be 3.8 and 8.2 days at room temperature of 20-24°C and 15-19°C, respectively; larval period was found to be 10.2 days at 20-24°C. Singh *et al.* (1994) [11] observed that during February- March, the average life span of larvae was 13-14 days, pupation was 87.5-91.35 per cent and adult longevity was 16.73 days.

The sex ratio (female: male) of *C. septempunctata* collected from different agro-ecosystem, viz., blond psyllium, mustard, coriander and fenugreek (table-2). It was highest in the sample collected from mustard crop (1.78), *vis- a-vis*, lowest in the blond psyllium (1.33). The female/male ratio in coriander and fenugreek crop was found in the middle order. The mean sex ratio of different agro-ecosystems was quite high (1.51) which showed great biotic potential of this predator.

Conclusion

Pre-mating period 6.55 days, mating period 51.85 minutes, pre oviposition period 10.05 days, oviposition period 15.10 days, post oviposition period 5.35 days fecundity 339.75 eggs/ female, hatchability 79.67 per cent, pupation 90.66 per cent and adult emergence 92.67 per cent were recorded in biotic potential study of *C. septempunctata*.

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References

1. Anonymous. Raw materials. The Wealth of India. Publication and Information Directorate, CSIR, New Delhi 1969, 146-154.
2. Anonymous. Rajasthan Agricultural Statistics at a glance, Published by Commissionerate of Agriculture, Rajasthan, Jaipur (Rajasthan) 2016-17, 144.
3. Farooqi AA, Sreeramu BS. Cultivation of Medicinal and Aromatic Crops. Universities Press, Hyderabad 2001, 144-150.
4. Gautam RD. Techniques for mass rearing of predators. *Biological Pest Suppression*, West will Publishing house, New Delhi 1994, 107-130.
5. Jindla LN, Brar KS, Butter NS. On the performance of some varieties of *Isabgol*, *Plantago ovata* against aphid. *Science and Culture* 1984;50(12):368-369.
6. Kumawat KC. Status of the insect pests and their natural enemies on blond psyllium, *Plantago ovata* Forsk in Rajasthan. *Indian Journal of Applied Entomology* 2008;22(1):66-67.
7. Lal RK, Khanuja SPS, Bansal K, Agnihotri AK, Mishra HO. Psyllium (*Plantago ovata*), its conservation and utilization. *Journal of Medicinal and Aromatic Plant Sciences* 2005;27:499-504.
8. Modi JM, Mehata KG, Gupta R. *Isabgol* is a Dollar earner of North Gujarat. *Indian Farming* 1974;23(12):9-14.
9. Sagar P. Population dynamics of *Aphis gossypii* Glover on the three cultivars of *Plantago ovata* in Punjab. *Journal of Research* 1989;26(1):77-79.
10. Sethi SL, Atwal AS. Influence of temperature and humidity on the development of different stages of ladybird beetle, *Coccinella septempunctata* (Linn.).

Indian Journal of Agricultural Sciences 1964;34(3):166-171.

11. Singh VS, Yadav RP, Singh R. Post embryonic development survival rate and predation potential of *Coccinella septempunctata* Linn. In relation to the mustard aphid (*Lipaphis erysimi* Kalt.) *Journal of Entomological Research* 1994;18(1):5-10.
12. Taneja A, Bhat CM, Arora A, Kaur AP. Effect of incorporation of *Isabgol* husk in low fibre diet on faecal excretion and serum levels of lipids in adolescent girls. *Eur. J Chn. Nut* 1989;43:197-202.