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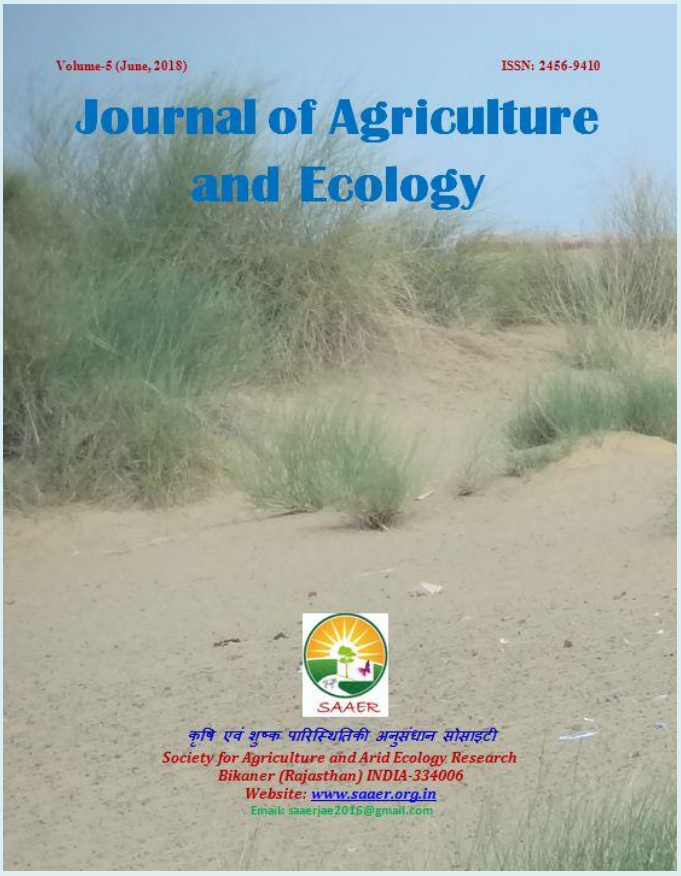

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Timely sowing effect on incidence of aphid, *Rhopalosiphum maidis* in blond psyllium, *Plantaga ovata*, Forsk

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Abstract

To find out the effect of different sowing dates on *Rhopalosiphum maidis* of blond psyllium, *P. ovata*, (Forsk) crop to determine the optimum sowing of dates. It is seen that the incidence and population fluctuation of *R. maidis* was dependent on the prevailed climatic conditions of the cropping seasons. The five different sowing dates revealed that early sown crop (9th November) had the minimum infestation (21.84 aphid/tiller) of aphids and highest seed yield (7.32 q ha^{-1}) was obtained as compared to the late sowing crop 30th December (51.02 aphids/tiller) whereas, minimum seed yield was obtained on sown crop 7th December (4.03 q ha^{-1}).

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Introduction

Isabgol is also known as blond psyllium, ispaghula, ispogel or Indian plantago. It belongs to the family Plantaginaceae with chromosome number 2n=8. Isabgol is a plant of West Asian origin and was introduced in India during Muslim settlement in middle age. Isabgol is the first ranking export commodity among medicinal plants in India. India continues to rank first in its production and trade in the world market. Isabgol is a medicinal plant valued for its thin white husk on seed which is prescribed as a drug for certain ailments in Unani and Ayurvedic systems of medicine (Karnick 1976). It is used as laxative in traditional system of medicine, being beneficial in habitual constipation, chronic diarrhea, dysentery and irritation of digestive tract. It has the property of absorbing and retaining water (40-90%) and therefore works as an anti-diarrhea drug. The low productivity of the crop is attributed due to the attack of insect pests and diseases. Among the insect pests exercising heavy toll of blond psyllium crop include aphids, *Rhopalosi phummaidis* (Fitch), *Aphis gossypii* Glov.; field cricket, *Gryllus* sp.; whitefly, *Bemisia tabaci* (Genn.) and field termites, *Odonto termesobesus* Rambur and *Microtermesobesi* Holmgren. Isabgol crop is attacked by number of insect pest, out of which aphid, *Aphis gossypii* Glover (Homoptera: Aphididae) has been reported as

major pest of isabgol (Sagar & Jindla 1984). The available literature indicated that not much work has been done on date of sowing specially in the arid-region of Rajasthan. Assessment of optimum sowing time has also been recognized as one of the main pre-requisites for the establishment of effective integrated pest management programme which has been examined in the paper.

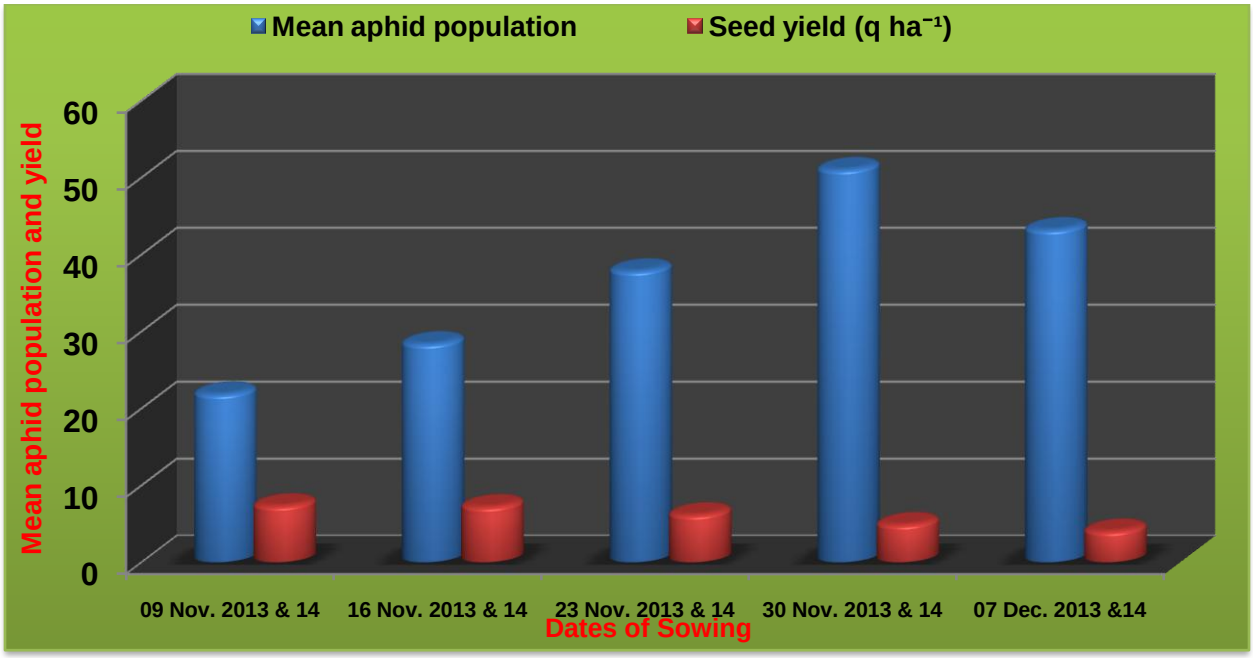
Materials and methods

An experiment was laid out in a simple randomized block design with five different dates of sowing *viz*., 9th, 16th, 23rd, 30th, and 7th each date replicated five times. The seeds of blond psyllium (variety RI-89) were sown in the plots measuring 3 x 2 m^2 at seven days intervals, starting from 9th November to 7th December, during both years *rabi*, 2013-14 and 2014-15. The row to row and plant to plant distance of 30 cm and 5 cm was maintained. The crop was allowed to have natural insect infestation. The observations on aphid population were recorded on five randomly selected tagged plants from each experimental plot soon after the appearance of aphid and then at weekly interval till harvesting the crop. Seed yield was also recorded after harvesting the crop. The per plot yield was converted into yield per hectare. The peak population of aphids recorded on different dates of sowing were transformed into log (X+1) values. The correlation coefficient and regression equations of date of sowing with aphid and yield were worked out by subjecting the data to simple correlation coefficient (r) and liner regression analysis. Coefficient of determination (variance explained) was calculated by simple correlation coefficient.

Results and discussion

Over all mean of the observations during *rabi*, 2013-14 and 2014-15 the minimum aphid population was found on the crop sown on 09th November (21.84 aphids/tiller) which was significantly superior over the rest dates of sowing. The maximum aphid population was recorded on the crops sown on 30th November (51.02 aphids/tiller) followed by 07th December (43.21 aphids/tiller) and these were at par to each other. Rest of the dates of sowing 16th November and 23rd November were observed in middle order with aphid population (28.38 and 37.85 aphids/tiller) respectively (Table 1 & Figure 1). Trehan et al. (1970), Singh (1979), Singh (1982), Sharma (1990), Ram & Pareek (1993), Marzouk & Bawab (1999), Khinchi & Kumawat (2014) and Jat et al. (2016) observed low population of aphid, *R. maidis* on early sown crop which corroborates with the present findings. The results of Patel & Singh (2018) on mustard aphid *L. erysimi* also corroborate the present findings with lowest aphid infestation on early sown crop.

Fig. 1 Effect of sowing dates on the incidence of *Rhopalosiphum maidis* of *P. ovata* during *rabi*, 2013-14 and 2014-15 (Pooled)



The present findings revealed that the maximum yield, *viz.*, 7.19 and 7.44 q ha^{-1} was observed is early sown crop (9th November) followed by 7.11 and 7.7.30 q ha^{-1} (16th November) in *rabi*, 2013-14 and 2014-15, respectively and these were at par to each other. However, minimum seed yield, *viz.*, 3.99 and 4.08 q ha^{-1} followed by 4.85 and 4.91 q ha^{-1} was obtained in late sown crop 7th December and 30th November during both years and found both are at par to each other. The pooled data of seed yield also showed that it was maximum (7.32 q ha^{-1}) followed by (7.21 q ha^{-1}) in early sown crop and minimum (4.03 q ha^{-1}) followed by (4.88 q ha^{-1}) in late sown crop (Table 1 & Figure 1). Trehan *et al.* (1970), Singh (1979), Sharma (1990), Ram & Pareek (1993), Marzouk & Bawab (1999), Khinchi & Kumawat (2014), Samadia & Haldhar (2017) and Jat et al. (2016) observed low population of aphid, *R. maidis* and comparatively higher yield on early sown crop which corroborates with the present findings.

Table 1. Effect of sowing dates on the incidence of *Rhopalosiphum maidis* of *P. ovata* during *Rabi*, 2013-14 and 2014-15 (Pooled)

S. No.	Sowing dates	Mean aphid population per tiller												Yield (q ha^{-1})
		Meteorological weeks of observations												
		2	3	4	5	6	7	8	9	10	11	12	Mean	
1.	09th Nov.	4.97 (0.78)*	11.37 (1.09)	19.14 (1.30)	23.17 (1.37)	32.72 (1.52)	39.60 (1.60)	50.12** (1.70)	33.83 (1.54)	14.20 (1.18)	8.79 (0.98)	2.34 (0.51)	21.84 (1.36)	7.32
2.	16th Nov.	2.46 (0.54)	8.06 (0.96)	13.20 (1.15)	32.31 (1.52)	44.83 (1.66)	51.67 (1.72)	70.17 (1.85)	49.90 (1.71)	21.71 (1.36)	13.23 (1.16)	4.64 (0.74)	28.38 (1.47)	7.21

3.	23rd Nov.	1.22 (0.35)	5.88 (0.84)	9.82 (1.03)	40.28 (1.62)	60.38 (1.79)	70.94 (1.86)	92.14 (1.97)	69.92 (1.85)	37.48 (1.59)	18.17 (1.28)	10.08 (1.04)	37.85 (1.59)	6.16
4.	30th Nov.	0.73 (0.24)	5.18 (0.79)	8.02 (0.96)	55.04 (1.75)	84.00 (1.93)	101.77 (2.00)	118.77 (2.08)	99.68 (2.01)	52.98 (1.73)	23.54 (1.39)	11.54 (1.10)	51.02 (1.72)	4.88
5.	07th Dec.	0.34 (0.13)	4.32 (0.73)	6.95 (0.90)	45.88 (1.67)	72.24 (1.86)	84.69 (1.93)	101.89 (2.01)	83.74 (1.93)	43.95 (1.65)	20.27 (1.33)	11.07 (1.08)	43.21 (1.65)	4.03
SEm±		0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.03	0.55
CD (5%)		0.06	0.08	0.09	0.08	0.08	0.09	0.09	0.09	0.08	0.08	0.06	0.08	1.19

* Figures in parenthesis are log (x +1) values, ** Peak aphid population during crop seasons

The correlation coefficient (r) of sowing dates with pooled data of population of aphids and yield also revealed similar trend, *viz.;* 0.891 and -0.976, respectively. Thus, there was significant positive correlation between aphid population and sowing dates and significant negative correlation between aphid population and seed yield of blond psyllium during both the years. The regression equation of sowing dates on incidence of aphid showed the relationship between the dates of sowing as X and incidence as Y_1, Y_2 and Y_3 during *rabi*, 2013-14 and 2014-15 and pooled, respectively. The variations explained by the equations were 79.2, 79.2 and 79.94 per cent during *rabi*, 2013-14, 2014 -15 and pooled of the total relations.

The 'b' values for aphid populations and dates of sowing were 0.998, 0.870 and 0.934 for the year *rabi*, 2013-14, 2014-15 and pooled, respectively (Table 2). This indicates that the expected aphid population increased from 13.75 to 15.75 aphids per tiller during *rabi*, 2013-14, 14.33 to 16.07 aphids per tiller during *rabi*, 2014-15 and 14.04 to 15.91 aphid per tiller in pooled, with the delay in sowing of the crop by every week.

Table 2. Regression equation between dates of sowing and incidence of *R. maidis* and yield of *P. ovata* during *rabi*, 2013-14 and 2014-15 (Pooled)

S. No	Particulars	Correlation coefficient (r)	Regression equation Y = a + byx	Coefficient of determination
1.	Sowing dates v/s Aphid incidence	0.891	14.978+0.934X	79.94
2.	Sowing dates v/s grain yield	-0.976	8.848-0.127X	95.27

The regression equation of sowing dates and yield of blond psyllium showed the relationship between dates of sowing as X and yield (q ha^{-1}) incidence as Y_4, Y_5 and Y_6 during *Rabi*, 2013-14, *Rabi*, 2014-15 and pooled, respectively. The variations explained by the equations were 94.9, 95.4 and 95.2, respectively. The equation showed the decreasing trend of the yield as sowing was delayed.

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