Effect of bee attractants on the attraction of *Apis dorsata* and their impact on seed yield of niger, *Guizotiaabyssinica* (L.f.)Cass, crop

Abstract

An experiment was conducted at experimental farm of PC Unit Sesame and Niger, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur, Madhya Pradesh, during *Kharif*2021. To determine the impact of bee attractants on the attraction of *Apis dorsata*and their impact on seed yield in niger crop, the experiment was set up using a RBD with nine treatments and three replications. Research found that the both at 10% and 50% flowering stage *Apis dorsata*visit was numerically highest with treatment, flower extract of *Madhuca longifolia* 10% with 20.42 and 19.25*Apis dorsata*/m^2/5min, respectively followed by rose water spray with 19.25 and 15.33*Apis dorsata*/m^2/5min, respectively. The population of *Apis dorsata*was received from the controlled condition (4.08 and 6.08*Apis dorsata*/m^2/5min at 10% and 50% flowering stage, respectively) followed by water spray (5.75 and 8.58*Apis dorsata*/m^2/5min at 10% and 50% flowering stage, respectively). The foliar spray of mahua flower extract and rose water 10% were found significantly superior over others in respect to record higher seed yield and recorded 6.90 q and 6.70 q/ha seed yield, respectively.

Keywords: Flower extract of *Madhuca longifolia* 10%,dates extract 10% and significantly superior.

1. Introduction

Niger [*Guizotiaabyssinica* (L. f.) Cass.] is a native of Tropical Africa and belong to the family Asteraceae (Compositae), it is known as lifeline of tribal agriculture and economy in India. It is grown by tribals on marginal and sub-marginal lands with negligible inputs under rainfed conditions(Ranganatha *et al.*, 2009)[9]. Niger is produced on an area of 112.8 thousand hectares in India, with a production of 40.3 thousand tonnes and an average productivity of 357.2 kg per hectare. Madhya Pradesh supplies roughly 16.0 thousand hectares of land, with an annual yield of 4.9 thousand tonnes and a seed productivity of 308.8 kg per hectare (Anonymous, 2021-22)[2]. It is used as an oilseed crop in India where it provides about 3% of the edible oil requirement of the country (Getinet and Sharma,1996)[4]. The niger seed content of quality oil of 32-40% with 18 to 24% protein in the seed, niger oil,

is pale yellow with nutty taste and a pleasant odour. The oil and seeds are free from any toxin and oil taste is similar to desi ghee.

Niger is self-incompatible with 100 per cent cross-pollinated crop. Insect pollination not only ensures the increase in seed yields of various cross pollinated crops including niger but also improve their quality. It ensures uniform maturity and early harvest of crops. Provision of bee colonies during the flowering period of crop is a simple but essential input. A planned bee pollination programme on national scale significantly contributes in solving the problem of edible oil shortage in the country even at the existing level of land use of oil crops (Mohana Rao *et al.*, 1981)[7]. Studies on effect of honey bee pollinators in niger crop indicated that the yield was reduced by 11-78 per cent in the absence of honey bee as well as natural pollinators. An additional income of Rs. 252 to Rs. 2125 including Rs. 1015/ha from honey was estimated through beekeeping with niger over open pollinated crops (Anonymous, 2005)[1]. Honey bees are considered as the most effective and ideal pollinators. Success of pollination with help of honey bees depends on their performance to the target crop over other following plants in the vicinity. Commercial and local bee attractants *viz.*,bee line, bee here, bee scent, bee scent plus, fruit boost, Bee-Q, sugar solution, sugarcane juice, jaggery solution, Molasses, etc. are being used to boost the foraging activities in pea, peach, blue berries, watermelon and apple in the United States, Spain and Canada. However, the related studies on use of bee attractants in India are scanty. The conservation and management of insect pollinators is gaining importance day by day. In this regard, the present experiment studies on effect of different bee attractants on attraction of rock honey bees and their impact on seed yield were studied.

2. Material and methods

The studies on effect of bee attractants on foraging activities of rock honey bees in niger crop was conducted in a randomized block design with three replication at experimental farm of PC Unit (ICAR) Sesame and Niger, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya,Jabalpur, Madhya Pradesh, during *Kharif* 2021.

Table. 1: List of attractants

Sl.No.	Treatments/attractants
1.	T_1-Flower extract of *Madhuca longifolia*10%
2.	T_2–Juice of *Sachharum officinarum*10%
3.	T_3-Jaggery solution10%
4.	T_4-Honey solution 10%

5. T_5 -Fruit extract of *Foenix dactylifera*10%
6. T_6-Sugar solution10%
7. T_7-Rose water(Marketed) 10%
8. T_8-Water spray.
9. T_9-Control

The above mentioned attractants were sprayed two times, first at 10% and second at 50% flowering stages. Recommended agronomical package of practices were followed for raising good and healthy crop. From each plot one-meter square area were selected randomly and number of giant honey bees visited the flowers were recorded. The observations were recorded a day before and 1st, 3rd, 5th and 7th day after first and second spraying and seed yield obtained from different treatments were recorded separately.

3. Results and discussion

The results of the present investigation revealed that all the bee attractants sprayed were significantlyaffect on foraging activities of rock honey bee in niger crop. They proved superior in recorded parameters overcontrol *i.e.,* unsprayed and without pollinators.

The result revealed that all the treatments were differed significantly to each other in respect to attract the population of *Apisdorsata*. At 10% flowering stage *Apis dorsata* visit was numerically highest with treatment, flower extract of *Madhuca longifolia*10% (20.42/m^2/5min) followed by (19.25/m^2/5min) rose water spray and juice of *S. officinarum* 10% (16.42/m^2/5min) while it was least on control (4.08/m^2/5min) followed by water spray (5.75/m^2/5min) and 10% sugar solution (11.50/m^2/5min).At 50% flowering stage the highest population of *Apis dorsata* was attracted with the plants sprayed with flower extract of *Madhuca longifolia* 10% (19.25/m^2/5min) followed by (16.33/m^2/5min) fruit extract of *Foenix dactylifera* while it was least (6.08/m^2/5min) on control followed by water spray (8.58/m^2/5min) and 10% sugar solution spray (10.92/m^2/5min). Present findings are also supported by the findings of Nidagundi (2004) they reported that spraying cacambe at (10 percent), Bee-Q at (1.25 percent) and jiggery solution at (10 percent) enhanced bee visitation to the flowers of bitter gourd.These findings are in close conformity with the earlier reports of Dwarka *et al.,* (2022) they reported that the 10% and 50% flowering stage *Apis dorsata* visit was numerically highest with treatment, mahua flower extract 10% with 50.71 and 52.46 giant honey bees/m^2/5min, respectively followed by rose water spray with 43.58 and 44.96 giant honey bees/m^2/5min, respectively. The population of giant honey bees was received from the open pollination without any spray (15 and 17.21 giant honey bees/m^2/5 min at 10% and 50% flowering stage, respectively) followed by water spray (18.67 and 19.76 giant honey bees/m^2/5min at 10% and 50% flowering stage, respectively). Present findings are

corroborated with the findings of Kalmath and Sattigi (2002) they reported that spraying of cacambe (10 percent) and jaggery (10 percent) attracted maximum number of *Apisdorsata* up to 15 days after first and second spray.

3.3. Seed yield (q/ha)

The data of seed yield revealed that all the treatments were differed significantly to each other in respect to record the higher seed yield.The highest seed yield (6.90 q/ha) was recorded with the treatment in which foliar spray of flower extract of *Madhuca longifolia*10%was applied followed by (6.70 q/ha) rose water 10 % and (6.30 q/ha) fruit extract of *F. dactylifera* spray while the least seed yield (3.15 q/ha) was recorded from the controlled conditionfollowed by (4.40 q/ha) 10% jiggery solution and water spray(4.80 q/ha).These findings corroborated with the findings of Chandrashekhar and Sattigi (2009)[3] they observed that spraying of bee attractant like cacambe (10%) and jaggary solution (10%) were significantly superior in enhancing both quantitative and qualitative parameters of radish seed.

Similarly Jayaramappa*et al.,* (2011)[5] observed that spraying of fruit boost@0.5ml/ litre enhanced yield parameters like number of fruits/plants to 19:00 and 17:00 fruits when compared to 10.66 fruits /plant in open pollinated plots.

4. Conclusion

From the above result it is concluded that for the attraction of*Apis dorsata*, flower extract of *Madhuca longifolia*10% was the best when sprayed at 10%and 50 % flowering stages, followed by rose water 10%, they attracted comparatively higher number of *Apis dorsata* and simultaneously recorded higher seed yield over others.

Table 2: Effect of different attractants on the attraction of giant honey bee, *Apis dorsata*, Fab. and their impact of seed yield in niger crop.

Treatment	Population of *Apis dorsata*/m^2/5minutes											
	1st spray at 10% flowering						2nd spray at 50% flowering					
	1DBS	Days after spray				Mean	1DBS	Days after spray				Mean
		1DAS	3DAS	5DAS	7DAS			1DAS	3DAS	5DAS	7DAS	
T_1-Flower extract of *M. longifolia* 10%	15.67 (4.02)	25.00 (5.03)	22.33 (4.75)	17.00 (4.17)	17.33 (4.18)	20.42 (4.55)	9.00 (3.08)	18.33 (4.31)	19.33 (4.43)	21.33 (4.66)	19.67 (4.27)	19.25 (4.43)
T_2-Juice of *S. officinarum* 10%	10.67 (3.34)	17.67 (4.24)	19.33 (4.45)	21.67 (4.69)	7.00 (2.67)	16.42 (4.10)	9.67 (3.15)	15.33 (3.97)	14.67 (3.89)	16.67 (4.13)	15.56 (3.39)	14.50 (3.86)
T_3-Jaggery solution 10%	9.00 (3.02)	16.00 (3.93)	18.67 (4.36)	20.00 (4.52)	8.33 (2.91)	15.75 (4.02)	9.00 (3.08)	17.67 (4.11)	14.67 (3.87)	15.67 (3.99)	16.00 (3.55)	15.08 (3.94)
T_4-Honey solution 10%	8.33 (2.96)	19.33 (4.44)	17.67 (4.24)	19.00 (4.38)	9.33 (3.12)	16.33 (4.08)	7.33 (2.78)	11.67 (3.46)	18.33 (4.33)	15.00 (3.89)	15.00 (3.06)	13.50 (3.73)
T_5- Fruit extract of *F. dactylifera* 10%	8.33 (2.97)	15.33 (3.86)	15.67 (3.95)	14.00 (3.77)	12.00 (3.50)	14.25 (3.83)	6.67 (2.64)	18.00 (4.19)	17.00 (4.16)	17.67 (4.26)	17.56 (3.60)	16.33 (4.08)
T_6-Sugar solution 10%	8.00 (2.89)	10.33 (3.29)	15.00 (3.80)	13.33 (3.70)	7.33 (2.66)	11.50 (3.41)	4.33 (2.18)	8.33 (2.94)	15.67 (3.90)	9.00 (3.01)	11.00 (3.27)	10.92 (3.34)
T_7-Rose water 10%	8.33 (2.96)	21.00 (4.63)	25.33 (5.07)	20.00 (4.52)	10.67 (3.24)	19.25 (4.43)	8.33 (2.96)	17.67 (4.25)	16.67 (4.08)	17.33 (4.20)	17.22 (3.07)	15.33 (3.96)
T_8-Water spray	9.33 (3.12)	5.33 (2.39)	5.67 (2.45)	9.00 (3.07)	3.00 (1.81)	5.75 (2.48)	6.33 (2.60)	7.33 (2.73)	7.00 (2.73)	13.67 (3.76)	9.33 (2.59)	8.58 (3.01)
T_9-Control	5.33 2.40)	4.67 (2.22)	5.00 (2.34)	4.67 (2.24)	2.00 (1.52)	4.08 (2.14)	4.67 (2.26)	4.67 (2.27)	6.00 (2.54)	9.00 (3.03)	6.56 (2.27)	6.08 (2.56)
SEm±	0.22	0.41	0.39	0.29	0.39	0.25	0.22	0.45	0.36	0.31	0.35	0.24
CD at 5%	0.66	1.24	1.17	0.88	1.18	0.74	0.66	1.36	1.07	0.92	1.05	0.71

*Figures in parenthesis are square root of √ x+0.5

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