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IMPACT OF DIFFERENT BEE ATTRACTANTS ON THE ATTRACTION OF INDIAN HONEY BEE, *APIS CERANA INDICA* AND THEIR IMPACT ON SEED YIELD OF NIGER, *GUIZOTIA ABYSSINICA* (L.F.) CASS, CROP

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ABSTRACT

A study 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 cerana indica* and their impact on seed yield of niger crop, the experiment was set up using a Randomized Block Design with nine treatments and three replications. Research found that the both at 10% and 50% flowering stage *Apis cerana indica* visit was numerically the highest with flower extract of *Madhuca longifolia* 10%, rose water 10% (14.00 *Apis cerana indica* /m²/5min) with 14.00 and 13.33 *Apis cerana indica* /m²/5min, respectively. This was followed by rose water 10% with 14.00 and 12.67 *Apis dorsata* /m²/5min, respectively. The population of *Apis cerana indica* was received from controlled condition 5.25 and 3.25 *Apis cerana indica* /m²/5min at 10% and 50% flowering stage, respectively. This was followed by water spray (5.81 and 5.42 *Apis cerana indica* /m²/5min) at 10% and 50% flowering stage, respectively. The foliar spray of flower extract of *M. Longifolia* 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.

Key words : Rose water, *Apis cerana indica*, Juice of *S. officinarum* and Significantly superior.

Introduction

Niger [*Guizotia abyssinica* (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). 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). 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). 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 (Dwarka *et al.*, 2022). 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 (Dwarka *et al.*, 2022). 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). 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). 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 of niger in the Jabalpur, Madhya Pradesh (Dwarka *et al.*, 2022). 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 *Apis cerana indica* and their impact on seed yield were studied.

Materials and Methods

Jabalpur a city in Madhya Pradesh is situated on the bank of Narmada river geographically located between 22° 49" and 24° 8" North latitude and 78° 21" East longitude and at an altitude of 411.78 m. above the mean sea level. The studies on effect of bee attractants on foraging activities of *Apis cerana indica* 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.

S. no.	Treatments/attractants
1.	T ₁ - Flower extract of <i>Madhuca longifolia</i> 10%
2.	T ₂ - Juice of <i>Sachharum officinarum</i> 10%
3.	T ₃ - Jaggery solution 10%
4.	T ₄ - Honey solution 10%
5.	T ₅ - Fruit extract of <i>Foenix dactylifera</i> 10%
6.	T ₆ - Sugar solution 10%
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. We got the caught insects verified with the help of Regional Center, ZSI, Jabalpur, Madhya Pradesh, India.

Results and Discussion

The results of the present investigation revealed that all the bee attractants sprayed were significantly effect on foraging activities of *Apis cerana indica* in niger crop. They proved superior in recorded parameters over control *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 *Apis cerana indica*. At 10% flowering stage *Apis cerana indica* visit was numerically highest with flower extract of *Madhuca longifolia* 10% and rose water 10% (14.00 *Apis cerana indica* /m²/5min) followed by (9.86/m²/5min) fruit extract of *F. dactylifera* spray and juice of *S. officinarum* 10% (7.94 *Apis cerana indica* /m²/5min), while it was lowest on control (5.25 *Apis cerana indica*/m²/5min) followed by water spray (5.81 *Apis cerana indica*/m²/5min) and 10% jaggery solution (6.61 *Apis cerana indica* /m²/5min). At 50% flowering stage the highest population of *Apis cerana indica* was attracted with flower extract of *Madhuca longifolia* 10% (13.33 *Apis cerana indica*/m²/5min) followed by (12.67 *Apis cerana indica* /m²/5min) rose water 10%, while it was lowest (3.25/m²/5min) on control followed by water spray (5.42 *Apis cerana indica* /m²/5min) and 10% jaggery solution spray (6.75/m²/5min). Present findings are also supported by the findings of Singh (2015), who reported that bees were observed that visiting the flowers *Apis florae*, *A. cerana indica* and *A. mellifera*. Present findings are corroborated with the findings of Manchare *et al.* (2019) showed that honey solution 10 percent flowering has highest (2.32 bees/m² /min) average ability to attract *Apis cerana indica* towards it followed by jaggery solution 10 percent (2.16 bees/m² / min) and molasses 10 percent (2.04 bees/m² / min).

Seed yield (q/ha)

The data of seed yield revealed that all the treatments were differed significantly to each other in respect to

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

Treatment	Population of <i>Apis c. indica</i> /m ² /5 minutes										Yield (q/ha)		
	1 st spray at 10% flowering					2 nd 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 <i>M. longifolia</i> 10%	3.67 (2.03)	12.00 (3.53)	11.00 (3.34)	14.00 (3.80)	18.00 (4.30)	14.00 (3.80)	4.67 (2.26)	15.67 (4.02)	16.33 (4.08)	13.00 (3.67)	8.33 (2.86)	13.33 (3.71)	6.90 (2.72)
T ₂ -Juice of <i>S. officinarum</i> 10%	5.67 (2.46)	14.33 (3.84)	7.33 (2.68)	5.33 (2.40)	4.67 (2.21)	7.94 (2.90)	4.00 (2.11)	10.67 (3.30)	13.00 (3.65)	17.33 (4.20)	5.33 (2.16)	11.58 (3.47)	5.82 (2.51)
T ₃ -Jaggery solution 10%	3.33 (1.95)	8.67 (3.02)	5.00 (2.11)	9.33 (3.07)	5.33 (2.39)	6.61 (2.66)	4.00 (2.08)	9.33 (3.12)	7.33 (2.79)	7.00 (2.73)	3.33 (1.94)	6.75 (2.69)	4.40 (2.21)
T ₄ -Honey solution 10%	3.67 (2.04)	9.33 (3.13)	9.33 (3.12)	9.00 (3.08)	6.67 (2.60)	8.58 (3.01)	3.67 (2.02)	11.33 (3.43)	6.00 (2.53)	10.00 (3.24)	4.33 (2.19)	7.92 (2.90)	5.45 (2.44)
T ₅ -Fruit extract of <i>F. dactylifera</i> 10%	2.33 (1.64)	10.00 (3.23)	10.33 (3.28)	10.33 (3.29)	9.00 (3.06)	9.86 (3.22)	5.00 (2.34)	12.33 (3.55)	11.00 (3.38)	12.00 (3.53)	3.00 (1.86)	9.58 (3.18)	6.30 (2.61)
T ₆ -Sugar solution 10%	3.00 (1.86)	13.00 (3.64)	7.67 (2.80)	8.33 (2.93)	5.67 (2.40)	8.69 (3.03)	3.33 (1.93)	12.67 (3.60)	15.00 (3.93)	12.33 (3.57)	6.33 (2.60)	11.58 (3.47)	6.00 (2.55)
T ₇ -Rose water 10%	4.33 (2.20)	12.33 (3.58)	19.00 (4.41)	11.00 (3.36)	14.00 (3.78)	14.00 (3.80)	5.33 (2.38)	13.67 (3.75)	16.00 (4.06)	17.33 (4.22)	3.67 (2.04)	12.67 (3.63)	6.70 (2.68)
T ₈ -Water spray	3.67 (2.02)	6.33 (2.58)	3.33 (1.93)	6.67 (2.67)	6.67 (2.67)	5.81 (2.51)	4.33 (2.19)	5.00 (2.34)	6.00 (2.54)	5.67 (2.48)	5.00 (2.32)	5.42 (2.43)	4.80 (2.30)
T ₉ -Control	1.67 (1.39)	5.33 (2.38)	2.67 (1.72)	7.00 (2.73)	6.33 (2.59)	5.25 (2.39)	1.00 (1.17)	3.67 (2.03)	3.33 (1.93)	3.00 (1.86)	3.00 (1.86)	3.25 (1.93)	3.15 (1.92)
SEM ±	0.18	0.21	0.35	0.25	0.32	0.13	0.19	0.25	0.21	0.18	0.35	0.11	0.03
CD at 5%	0.54	0.64	1.04	0.76	0.95	0.40	0.57	0.74	0.62	0.54	1.06	0.33	0.09

*Figures in parenthesis are square root of $\sqrt{x+0.5}$



Plate 1 : Experimental field.



Plate 2 : 10% flowering stage. **Plate 3:** 50% flowering stage.

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 condition followed 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), 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. These findings are in close conformity with the earlier reports of Dwarka *et al.* (2022), they reported that highest seed yield (6.90 q/ha) was recorded with the treatment in which foliar spray of flower extract of *Madhuca longifolia* 10%.

Similarly, Jayaramappa *et al.* (2011) 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.

Conclusion

From above results, it is concluded that for the

attraction of *Apis cerana indica*, flower extract of *Madhuca longifolia* 10% was the best when sprayed at 10% and 50% flowering stages, followed by rose water 10% and fruit extract of *Foenix dactylifera* 10%, they attracted comparatively higher number of *Apis cerana indica* and simultaneously recorded higher seed yield over others.

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