



**Full Length Research Article**

**COMPARISON OF FORAGING BEHAVIOUR OF APIS SPECIES RELATED TO POLLINATING EFFICIENCY ON PARENTAL LINES OF *BRASSICA NAPUS L.***

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**ARTICLE INFO**

**Article History:**

Received 16<sup>th</sup> December, 2014  
Received in revised form  
22<sup>nd</sup> January, 2015  
Accepted 26<sup>th</sup> February, 2015  
Published online 17<sup>th</sup> March, 2015

**Key words:**

*Apis cerana* F.  
*Apis dorsata* F.  
*Apis florea* F.  
*Apis mellifera* L.  
*Brassica napus* L.  
Pollination efficiency.

**ABSTRACT**

A study was conducted on relative pollination efficiency of *Apis* species on hybrid seed production plots of *Brassica napus*. Observations on foraging behaviour of four honey bee species (*Apis mellifera*, *A.dorsata*, *A.cerana* and *A.florea*) visiting parental lines of *B. napus*, revealed that all foragers (100 per cent) of *A.mellifera* and *A.dorsata* were top workers and came in contact with reproductive parts of flowers of both lines. Percentage of such bees was lower in case of *A. cerana* and the lowermost as far as *A.florea* was concerned. On the basis of foraging behaviour, it was concluded that *A.mellifera* and *A.dorsata* were the best pollinators, followed by *A.cerana* and *A.florea*.

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**INTRODUCTION**

Knowledge of foraging behaviour of honey bees on particular crop is important in practical management of bees to increase cross – pollination and crop yield. Foraging behaviour is one of important factors to compare pollination efficiency of various *Apis* species. The *Apis* species that has relatively more percentage of bees foraging as top workers, which are coming in contact with reproductive parts of flowers may be considered as efficient pollinator while side workers rob nectar and do not help in pollination. Top or side working of bees on flowers of *Brassica* species is associated with floral size (Free and Williams, 1973; Mohr and Jay, 1988) Morphology of essential organs of flowers also dictate the foraging behaviour of bees (Free, 1960). Size and other morphological characters of different species of honey bees are of considerable importance in this respect. The present paper reports the foraging behaviour of four honeybee species on male and female lines of *B. napus* to assess their pollination efficiency.

**MATERIALS AND METHODS**

Hybrid seed production plots were raised under Punjab conditions by sowing seeds of restorer (R) line (TFR-91) and cytoplasmically male sterile (CMS) line (TCMS-PR-05) of *B.napus* hybrid PGSH-51, by following recommendations of Punjab Agricultural University, Ludhiana (Punjab). Selected ratios of male to female rows were 2:4, 1:4 and 1:8. Early flowering R line plants were detopped to make the flowering of two lines synchronous. Enough foraging activity of *A dorsata* was noticed in area selected for study. In order to compare foraging behaviour of four honey bee species, two colonies each of *A mellifera*, *A. cerana* and *A florae* (comb transfer technique) were managed. Foraging behaviour was observed daily during flowering season of crop at 1000, 1200, 1400, and 1600 hours.

Number of bees, top workers and bees coming in contact with reproductive parts of flowers, of each *Apis* species were noted on randomly selected one meter row length of CMS and R lines per minute with the help stop watch. Thus percentage of top workers and bees coming in contact with reproductive parts of flowers were calculated. Various data collected were consolidated, tabulated, transformed (arc sin

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**Table 1. Percentage of top worker bees of different *Apis* species on parental lines of *B.napus*.**

Parental line	Percentage of top worker bees			
	<i>A.cerana</i>	<i>A.mellifera</i>	<i>A.dorsata</i>	<i>A.florea</i>
R.line	88.141 (70.6)	100 (90)	100 (90)	66.252 (55.5)
	GM. 76.512		SEM 3.056	
	CD 0.05 9.775		CV 7.987	
CMS line	97.354 (83.5)	100 (90)	100 (90)	83.944 (67.2)
	GM 82.667		SEM 2.658	
	CD 0.05 8.504		CV 6.432	

Figures in parenthesis are arc sin transformations.

**Table 2. Percentage of bees of different *Apis* species which came in contact with reproductive parts of flowers on parental lines of *B.napus*.**

Parental line	Percentage of bees coming in contact with reproductive parts of flowers			
	<i>A.cerana</i>	<i>A.mellifera</i>	<i>A.dorsata</i>	<i>A.florea</i>
R.line	86.328 (68.7)	100 (90)	100 (90)	62.755 (53.1)
	GM 75.443		SEM 2.714	
	CD 0.05 8.683		CV 8.274	
CMS line	96.126 (82.3)	100 (90)	100 (90)	83.834 (67.2)
	GM 82.386		SEM 2.790	
	CD 0.05 8.924		CV 6.773	

Figures in parenthesis are arc sin transformations

transformations) and subjected to analysis of variance and significance was tested at 5 per cent level.

## RESULTS AND DISCUSSION

All the foragers (100%) of *A.mellifera* and *A.dorsata* visiting R and CMS lines of *B.napus* as observed (Table 1) in present study, were top workers. No side worker of these two bee species was noticed during study. It was also observed that all these top workers were touching with the reproductive parts of flowers of both the lines (Table 2). These findings are in line with the reports given by Free and Nuttall (1968) that all the *A.mellifera* bees foraging on oilseed rape (*B.napus* cultivar Nilla) entered from the front of the flower and they usually touched the stigma and stamens. In case of *A.cerana*, percentage of top workers (88.141 and 97.354 per cent on R and CMS line respectively) as well as of bees which came in contact with reproductive parts of flowers were (86.328 and 96.126% on R and CMS line respectively) low as compared to those of above mentioned bee species (*A.dorsata* and *A.mellifera*).

In case of *A.florea* such percentages were found to be significantly lower as compared to those of other three *Apis* species (Table 1 and 2). The differences in percentages of top workers as well as of bees which came in contact with reproductive parts of flowers among various bee species might be because of difference in size, shapes, other morphometric and innate characteristics of them. Large sized bees usually forage as top workers and touch reproductive parts of flowers. In general, it was noted that in case of *A.cerana* and *A.florea*, percentages of both top worker bees and bees which came in contact with essential parts of flowers were comparatively higher on flowers of CMS line than those on R. line (Table 1 and 2). This may be due to the reason that CMS line flowers were comparatively smaller in

size and also differ in other morphological and physiological characteristics. Free and Williams (1973) also observed that thieving and side working from *Brassica* species was associated with floral size. Similar type of information was given by Mohr and Jay (1988) while studying foraging behaviour of honey bees on *B.napus* and *B.campestris*. Free (1960) observed that difference in morphology of essential organs of flowers dictate their foraging behaviour. The *Apis* species which has relatively more percentage of bees foraging as top workers and most of them came in contact with reproductive parts of flowers are more likely to pollinate the flowers they visited. Side workers only rob the nectar and do not help in pollination. Thus on the basis of present study it may be concluded that *A.dorsata* and *A.mellifera* were the best pollinators, followed by *A.cerana* and *A.florea*. The foraging behaviour of *Apis* species seems to be dictated by size, shape, other morphological and innate characteristics of their own and those of flowers of the crop concerned.

## REFERENCES

- Free, J. B. 1960. The behaviour of honeybees visiting the flowers of fruit trees. *J.Anim.Ecol.* 29:385-395
- Free, J. B. and Nuttall P. M, 1968. The pollination of oilseed rape (*Brassica napus* L.) and the behaviour of bees on the crop. *J. Agric. Sci.* 71:91-94
- Free, J. B. and Williams, I. H., 1973. The foraging behaviour of honeybees (*Apis mellifera* L.) on Brussels sprouts (*Brassica Oleracea* L.) *J. Appl. Ecol*, 10: 489-499
- Mohr, N. A. and Jay, S. C., 1988. Nectar and pollen collecting behaviour of honeybees on Canola (*Brassica Campestris* L. and *Brassica napus* L.) *J.Aplic.Res.*, 27:131-136