

Studies on Stigma Receptivity in Indian Mustard

K.S. MANKAR, J.B. YADAV, N.C. SINGHAL, SURENDRA PRAKASH AND ASHOK GAUR

Division of Seed Science & Technology I.A.R.I., New Delhi 110 012
nc.singhal@yahoo.com

ABSTRACT Stigma receptivity in different CMS lines and genotypes of mustard was studied by pollinating the stigmas daily upto 8 days of starvation. Seed bearing siliquae developed on pollinated buds and seed per siliquae were counted at maturity. Stigma receptivity was found to be at its peak a day before anthesis which declined gradually upto 3-5 days and drastically thereafter. Stigma ceased to be receptive after 6-8 days. Plants kept on pollination starvation, increased spike length, flowering duration and stigma per flower for capturing the pollen.

The nature and magnitude of seed set in mustard [*Brassica juncea* (L.) Czern & Coss] particularly in male sterile lines is the most important factor which influence the seed yield. Among important floral characteristics, longer duration of stigma receptivity is necessary to obtain adequate seed setting. When pollen grains are not available in the same flower as in case of male sterile lines, stigma receptivity plays a rather important role in pollination and seed setting. The present study was carried out to study the longevity of receptive stigma in Indian mustard.

MATERIALS AND METHODS

To study longevity of receptive stigma, 200 matured buds which were likely to open on the next day were selected on three CMS lines viz. *tour*, *oxy*, *siif* and two genotypes namely, MH-7 and PSR-7. Among these five lines only the PSR-7 was male fertile. MH-7 was male sterile F₁ hybrid between Pusa Barani CMS (oxyrrhina cytoplasmic background) and PSR-7. Therefore, the selected buds were emasculated in PSR-7. Emasculatation was not required in other four lines. Immatured buds and opened flowers were clipped off from the same spike. Selected buds were covered with butter paper envelopes and subjected to starvation of stigma for different duration. Pollination was started one day before opening of the buds (anthesis) and continued

till 8 days after anthesis. Twenty buds/flowers in each CMS line and genotype were pollinated between 10.00-11.00 AM daily with fresh pollen from male fertile plants. Pollinated buds/flowers were again covered with butter paper bags. The observations on seed bearing siliquae formed out of 20 pollinated flowers and seed per siliqua were recorded at the time of maturity. The study was conducted at IARI Farm, Delhi during peak flowering time i.e. the month of January. The mean RH and day and night temperature during peak flowering period were 70 per cent, 19.6°C and 5.9°C, respectively. The statistical analysis for seed per siliqua was made with Complete Randomized Design (CRD), considering each pod as one replication.

RESULTS AND DISCUSSION

The maximum seed bearing siliquae per 20 pollinated-buds were formed by pollinating the buds one day before anthesis (Table 1). This has been noticed in all CMS lines, MH-7 and PSR-7. The number of seed bearing siliquae per 20 pollinated buds decreased gradually thereafter. It showed that stigma receptivity was at its peak one day before anthesis and remained considerably with high degree of receptivity up to 3rd day after anthesis. The pollination two or more days before anthesis was not recorded in this study. In *tour*

CMS and MH-7, the number of seed bearing siliquae declined gradually till five days after anthesis and drastic reduction was observed on sixth day after anthesis. The seed bearing siliquae in *tour* CMS and MH-7 were twelve and fourteen, respectively on fifth day after anthesis as compared to only four and eight on the sixth day. In other three lines, gradual decline in seed bearing siliquae was observed till three days after anthesis and thereafter number of seed bearing siliquae reduced drastically. In *oxy* CMS, *siif* CMS and PSR-7, 12, 16 and 12 seeds bearing siliquae, respectively, were formed on third day after anthesis whereas it declined to 8, 9 and 7 on fourth day after anthesis.

The data (Table 1) revealed that seeds per siliqua were significantly higher in buds pollinated one day before anthesis in all CMS lines and genotypes than buds pollinated thereafter. The highest mean number of seed/siliqua in *oxy* CMS, 149 CMS and PSR-7 were comparable with each other but significantly higher than in *tour* CMS. On 4th day after anthesis, 60 per cent or more reduction in seed setting was observed in *tour* CMS, *siif* CMS and PSR-7 while more than 50 per cent reduction was recorded in *oxy* CMS and MH-7. On the overall mean basis, only 40, 29 and 19 per

cent seed per siliqua were recorded on 4th, 5th and 6th day, respectively after anthesis. Three genotypes, i.e., *oxy* CMS, *siif* CMS and PSR-7 ceased to be receptive on sixth day after anthesis while, two genotypes i.e., *tour* CMS and PSR-7 were receptive upto 8 days. However, their degree of receptivity was 16 per cent only on 8th day. The present study showed that stigma may remain receptive 6-8 days after anthesis though, the degree of receptivity reduced drastically (60 %) after 3 day. Eisikowitch [1] indicated that stigma in *B. napus* is receptive before flower opens. Labana and Banga [2] while studying floral biology of Indian mustard (*B. juncea*) observed variation among the varieties for stigma receptivity and maximum receptivity was recorded one day before flower opening. Byun and Park [3] obtained highest seed production from the bud pollinated two days before anthesis in Chinese cabbage. Rai [4] reported that stigma in *Brassica* remains receptive for six days. The frequency of these flowers were found to be lower and present only on the plant which could not get pollen, hence, failed to form seed bearing siliquae. In conclusion, the stigma receptivity declined gradually up to 4-5 days after anthesis, there after drastic decline was recorded and after 6-8 days stigma ceased to be receptive.

Table 1. Stigma receptivity in different genotypes and CMS lines

Days of pollination	Mean number of seed bearing siliquae on 20 pollinated buds/flowers					Mean number of seed/siliqua				
	<i>tour</i> CMS	<i>oxy</i> CMS	<i>siif</i> CMS	MH-7	PSR-7	<i>tour</i> CMS	<i>oxy</i> CMS	<i>siif</i> CMS	MH-7	PSR-7
One day before anthesis	19	19	20	20	18	10.70	15.00	14.00	16.20	15.00
Day of anthesis	18	18	19	19	16	18.14	14.00	13.00	16.00	14.00
Days after anthesis										
1	18	14	18	19	16	8.11	11.20	12.75	14.00	13.20
2	18	12	17	18	15	7.83	8.20	11.10	12.30	11.50
3	16	12	16	18	12	6.20	7.50	9.64	10.00	7.00
4	14	8	9	16	7	4.38	7.20	4.83	7.00	5.00
5	12	7	5	14	5	4.25	3.81	3.50	6.00	3.20
6	4	3	2	8	3	3.25	2.00	1.50	4.50	2.00
7	3	0	0	4	0	2.80	0.00	0.00	2.00	0.00
8	1	0	0	2	0	1.75	0.00	0.00	2.00	0.00
Mean						6.74	6.89	7.03	9.00	7.09

C.D. at 5 % level Day of pollination (D): 0.80; Genotype (G): 0.56 D x G: 1.78

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