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Effect of flowering regime and flower age on self incompatibility response in S-allele lines of cabbage (*Brassica oleracea* var. *capitata* L.)

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Abstract

Five S-allele lines of cabbage *viz*., I-4-3, I-4-6, II-12-4-9, III-1-2 and SC-5-5-4 were studied for their self incompatibility response. This was ascertained through self-pollinations carried out in opened flowers of different ages (0, 1, 2 and 3 days old) in three flowering regimes (25-50%, 50-75% and > 75% flowering). The results were interpreted on the basis of seed-set data obtained. The S-allele lines I-4-3, I-4-6, II-12-4-9 and III-1-2 showed stability of self incompatibility across flowering regimes and flower ages and thus have a good potential to be used as parents in the hybrid development programme.

Key words: *Brassica oleracea* var. *capitata*, cabbage, flowering regime, flower age, S-allele stability, self incompatibility response.

Introduction

Cabbage is one of the most important cole crop vegetables in the world. In Himachal Pradesh, it is being cultivated extensively as an off-season vegetable in mid and high hills. Hybrids are known to perform better than open pollinated varieties on account of their higher yield, uniform maturity and quality produce. The genetic phenomenon of sporophytic self incompatibility (SSI) has been utilized commercially for the production of hybrids in cabbage for the last over six decades in agriculturally advanced countries (Riggs, 1988). Of late, cabbage hybrid KGMR-1 has been developed at IARI, Regional Station, Katrain by using SSI (Anonymous, 2005). At CSKHPKV, Palampur, homozygous self incompatible (S-allele) lines have been developed in mild chill requiring genotypes of cabbage and their inter-allelic relationships have been studied. Stability of S-allele lines across flowering regimes and self pollinations carried out after anthesis till the petals start withering is essential to avoid the possible selfs and sibs in the ultimate hybrid seed to be produced by using the S-allele lines. Hence, the present study was undertaken to ascertain the effect of flowering regime and flower age on self incompatibility response in the S-allele lines of cabbage developed at CSK HPKV, Palampur.

Materials and Methods

The experimental materials consisted of five S-allele lines viz., I-4-3, I-4-6, II-12-4-9, III-1-2 and SC-5-5-4 of cabbage developed at CSK Himachal

Pradesh Krishi Vishvavidyalaya, Palampur. During 2007-2008, these S-allele lines were planted at the Experimental Farm of the university. After heading, the plants producing compact heads were retained for bolting and flowering. These were covered with UV stabilized nylon net insect proof enclosures before flowering so as to avoid cross pollination in nature. Three plants were taken at random for pollination work in each S-allele line.The pollination treatments comprised of self pollination of 0 (on the day of anthesis), 1, 2 and 3 day old flowers in three flowering regimes *viz*., 25-50%, 50-75% and > 75% flowering. Ten flowers were taken for each pollination treatment. Average seed set/siliqua in different pollinations based on three plants in each of the S-allele lines were recorded and used in interpreting the results.

Results and Discussion

The average effects of flowering regimes and flower ages on seed set in different S-allele lines of cabbage are given in Tables 1 and 2, respectively. In S-allele line I-4-3, the average seed-set/siliqua in 25-50%, 50-75% and >75% flowering regimes were 0.03, 0.06 and 0.02, respectively. In S-allele line I-4-6, the average seed-set/siliqua in 25-50%, 50-75% and >75% flowering regimes were 0.10, 0.01 and 0.01, respectively. In S-allele line II-12-4-9, the average seed-set/siliqua in 25-50%, 50-75% and >75% flowering regimes were 0.03, 0.00 and 0.00, respectively. In S-allele line III-1-2, the average seed-set/siliqua in 25-50%, 50-75% and >75% flowering regimes were 0.06, 0.01 and 0.00, respectively. In S-allele line SC-5-5-4, the average seed-set/siliqua in 25-50%, 50-75% and >75% flowering regimes were 0.11, 0.12 and 0.14, respectively.

In S-allele line I-4-3, the average seed-set/siliqua in 0, 1, 2 and 3 days old flowers were 0.06, 0.08, 0.00 and 0.00, respectively. In S-allele line I-4-6, the average seed-set/siliqua in 0, 1, 2 and 3 days old flowers were 0.02, 0.06, 0.07 and 0.00, respectively. In S-allele line II-12-4-9, the average seed-set/siliqua in 0, 1, 2 and 3 days old flowers were 0.03, 0.01, 0.00 and 0.00, respectively. In S-allele line III-1-2, the average seed-set/siliqua in 0, 1, 2 and 3 days old flowers were 0.09, 0.00, 0.00 and 0.00, respectively. In S-allele line SC-5-5-4, the average seed-set/siliqua in 0, 1, 2 and 3 days old flowers were 0.12, 0.14, 0.07 and 0.13, respectively.

Four of the five S-allele lines *viz.,* I-4-3, I-4-6, II-12-4-9 and III-1-2 did not show much change in average seed set/siliqua upon self-pollination with the advancement in flowering regimes (Table 1) and can be considered as stable. In the S-allele line SC-5-5-4, there was slight increase in seed-set from 0.11 seeds/siliqua in 25-50 % flowering regime to 0.14 seeds/siliqua in > 75% flowering regime. As regards seed-set/siliqua upon self-pollination in open flowers of different ages (0-3 days old), the S-allele lines I-4-3, I-4-6, II-12-4-9 and III-1-2 proved stable since these did not reveal much change. Although, the S-allele line SC-5-5-4 also proved stable but there was relatively higher seed-set/siliqua ranging from 0.07-0.14 seeds/siliqua (Table 2).

The results of the present study are in general agreement to those of Johnson (1971), Ockendon (1973) and Murugiah *et al.* (1987) as regards the influence of flowering regimes and to those of Lawson and Williams (1976) and Murugiah *et al.* (1987) pertaining to the effect of flower age on the expression of self-incompatibility in cole crops. Since the S-allele lines I-4-3, I-4-6, II-12-4-9 and III-1-2 showed stability of self incompatibility across flowering regimes and flower ages, they have a good potential as parents in the hybrid development programme.

Table 1. The average effect of flowering regimes on seed-set in different S-allele lines

Flowering regimes→ S-allele line→	Average seed-set/siliqua in different flowering regimes		
	25-50%	50-75%	>75%
I-4-3	0.03	0.06	0.02
I-4-6	0.10	0.01	0.01
II-12-4-9	0.03	0.00	0.00
III-1-2	0.06	0.01	0.00
SC-5-5-4	0.11	0.12	0.14

*Each figure in this table is the average of three plants

Table 2. Effect of flower ages on seed-set in different S-allele lines

Flower ages→ S-allele line→	Average seed-set/siliqua in different flower ages			
	0	1	2	3
I-4-3	0.06	0.08	0.00	0.00
I-4-6	0.02	0.06	0.07	0.00
II-12-4-9	0.03	0.01	0.00	0.00
III-1-2	0.09	0.00	0.00	0.00
SC-5-5-4	0.12	0.14	0.07	0.13

*Each figure in this table is the average of three plants

References

Anonymous 2005. Proceedings of the 23rd Group Meeting of All India Coordinated Research Project on Vegetable Crops held at Bidhan Chandra Krishi Vishvavidyalaya, Kalyani, Nadia, West Bengal, April 16-19.

Johnson AG 1971. Factors affecting the degree of self-incompatibility in inbred lines of Brussels sprouts. Euphytica **20**: 561-73.

Lawson J and Williams W 1976. Environmental and genetic effects on pseudo-compatibility in *Brassica oleracea* in relation to the production of hybrid seed. J. Hort. Sci. **51**: 359-65.

Murugiah S, Vidyasagar, Chatterjee S.S. and Swarup V. 1987. Stability of S-allele lines of cauliflower. Indian J. agri. Sci. **57**: 845-47.

Ockendon DJ. 1973. Self-incompatibility behaviour of inbred lines of Brussels sprouts in the field. Incompatibility Newsletter **3**: 30-34.

Riggs TJ 1988. Breeding F_1 hybrid varieties of vegetables. J. Hort. Sci. **63**: 369-82.