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Short Note

Influence of Positional Polymorphism on Seed Yield and Seed Quality Characters in Petunia

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Polymorphism is the occurrence of different forms of individuals in single species or the presence of distinct forms in a species particularly with certain habitat or population. Physical polymorphism is common occurrence in seed, which occurs due to the flowering behaviour (reflected on seed formation and maturation), plant senescence or places of seed formation on the mother plant. The latter one is known as positional polymorphism and influences the morphological and physiological characters of seeds (Strona, 1964). Radha (1991) and Kalavathi (1997) in green manures and medicinal plants respectively observed such positional polymorphism and correlated its influence with seed quality characters. Knowledge on this is warranted for selection of source seed for breeder / nucleus classes and times for foundation seed, which are precious in maintenance of seed for future generation. In the present investigation, studies were carried out in petunia owing to their continuous flowering habit, with the idea to trace the influence of position of pod on seed and seedling quality characters.

Bulk crop of petunia cv. Mix was raised during June 2002 in the Botanical Garden, Tamil Nadu Agricultural University, Coimbatore. In a bulk crop, at the time of flowering ten different plants were randomly selected with replications and were divided into three equal parts as top, middle and bottom based on the total height of the plant. Ten pods were collected separately in each of the above situation and the yield and seed quality parameters *viz*.,weight pod^{-1} (g), number of seeds pod^{-1}, seed weight pod^{-1}(g), 100 seed weight (mg) (ISTA, 1999), germination (%) (ISTA, 1999), drymatter production (mg 20 sedlings^{-1}) vigour index (Abdul Baki and Anderson, 1973), electrical conductivity (dSm^{-1}) (Presley, 1958), Free amino acid (OD value) (Ching and Ching, 1964), Amylase enzyme activity (g min^{-1}) (Paul *et al.,* 1970), ATPase enzyme activity (mmol g $^{-1}$ h^{-1}) (Unbreit *et al*., 1964), Catalase enzyme activity (ml min^{-1}) (Povolorskaya and Dadenka, 1956) and Peroxidase enzyme activity (Difference in OD g^{-1} h^{-1}) (Malik and Singh, 1980) were evaluated.The data gathered were analysed statistically adopting the procedure described by Gomez and Gomez (1984) for evaluating the treatmental significance.

Highly significant differences were obtained due to position of pod on plant for all the evaluated pod, seed and seed quality characters except for drymatter production (mg 20 seedlings^{-1}) and electrical conductivity (dSm^{-1}) (Table 1).The seeds collected from middle portion of plant recorded higher seed and seedling quality characters and was followed by seeds of bottom and top portion of plant. Among the observed characters, the seed number pod^{-1} was 6 and 20 per cent higher in middle position pod (plant) than bottom and top positions of plant respectively. The weight pod^{-1} and seed weight pod^{-1} were also higher in middle pods or seeds of middle pod than pods of bottom and top position of the plant. Srimathi and Ramasamy (1992) on analysing the variation in seed characters due to pod position expressed that the reduced size and weight of the seeds in both proximal and distal ends of pod could be ascribed to time lag between fertilisation and consequent

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changes in the supply of nutrients and the difference in fertilisation also could lead to differences in developmental stages thereby causing variation in seed and pod weight. But Guppy (1912) reported that formation of heavier seeds in the distal end of the pod might be attributed to the ovule abortion in one locule changing the shape of the seed developed in the next locule. Jackson *et al.* (1977) also expressed that source sink relationship is not uniform to all over the pla nt canopy and gets varied with light interception and nutrients translocation. Among the evaluated physiological seed characters, the germination exposed variation due to the position of seed at mother plant , which was higher in middle position, by 1 and 5 per cent compared to bottom and top positions of the plant respectively.The seedling vigour parameters evaluated were also in line with said seed characteristics. Such difference is highly possible in petunia due to their basipetal flowering behaviour. The first developed seeds in the bottom position would have attained physiological maturity earlier and exposed to weather condition and should have resulted in shattering of seed with lesser seed recovery from pod. The unopened pods developed later than the middle portion pod might have developed earlier than the bottom flowers that are unopened and later than bottom flowers that are half opened. Such differences in quality related to position of the seeds within plant was also reported by Froud William and Ferris (1987) and Adam *et al.* (1989), in different crops. Marwadi and Katarki (1985) also opined that the top region due to late flowering and the wider distance for translocation of nutrients from source to sink favoured the development of smaller sized seeds with less food reserves resulting in poor germination potential and vigour characters as late formed pods were in weak competition in drawing nutrition under changing micro and macro environment when compared to the ones already under development on the bottom portion of the

Table 1. Influence of position of pod on plant on pod, seed and resultant seed and seedling quality characteristics

Parameters	Position at plant			Bulk	CD (P=0.05)
	Top	Middle	Bottom		
Weight pod^{-1} (g)	0.0720	0.1184	0.1089	0.1017	0.002
Number of seeds pod^{-1}	710	890	840	821	43.131
Seed weight pod^{-1} (g)	0.0526	0.0815	0.0736	0.0645	0.004
100 seed weight (mg)	9.0	10.3	9.8	9.7	0.538
Germination (%)	93(74.90)	98(82.82)	97(80.83)	90(79.52)	3.483
Drymatter production (mg 20 seedlings^{-1})	1.7	2.1	2.0	1.9	NS
Vigour index	157	205	193	187	37.445
Electrical conductivity (dSm^{-1})	0.036	0.028	0.031	0.034	NS
Free amino acid (OD value)	0.010	0.003	0.005	0.006	0.002
Amylase activity (g min^{-1})	48.45	57.72	50.83	53.54	4.296
ATPase activity (mmol g^{-1} h^{-1})	3.50	4.68	4.3	4.0	0.497
Catalase activity (ml min^{-1})	0.118	0.142	0.135	0.130	0.005
Peroxidase activity (Diff in OD g^{-1} h^{-1})	5.985	6.889	6.128	6.640	0.354

(Figures in parentheses indicate arc sine values)

plant. Moreover the early formed seeds could have the chance of escape from adverse environmental conditions and pest and diseases which affect the later stages of crop growth (Sasthri, 2001).

Seedling vigour of the present study was also high in seeds collected from the middle and proximal portion of a pod, which might be due to the deposition of more metabolites in seeds formed in the middle of the pods as revealed by Srimathi and Ramasamy (1992). Black (1958) and Abdul Baki and Anderson (1973) also opined that decrease in vigour of seed at the distal end might be due to the adequacy of mobilisation of reserves for germination and it could not be compensated for further growth of the seedling that resulted in lesser vigour status of seedlings.Thus the study expressed that seeds of middle portion of plant are better in seed and seedling quality characters and was followed by pods of bottom and top portion of plant.

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