

Effect of structural ideotypes on yield and yield attributes in sesame (*Sesamum indicum*)*

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The idea of productive sesame (*Sesamum indicum* L.) ideotype has yet not been properly described. Architectural diversity of dicotyledonous plants results from the varied growth patterns of apical and auxiliary meristem (Sussex and Kerk 2001). The role of branching which predominantly control the structural ideotype of a dicotyledonous plant has not also been properly elucidated in sesame. Though, recently breeding work to improve the ideal plant type of sesame through combining contrasting characters including branching as one of the traits had been done (Bayder 2005). Information regarding the influence of different structural ideotypes ranging from single stem to numerous branches on growth and yield in sesame becomes prerequisite to construct or breed an ideal plant type. Although number of branches is reported by many workers to show highly significant positive correlation with seed yield, no serious effort has yet been made to study the role of branching-patterns and their inheritance in sesame. The present study was therefore undertaken by constructing different ideotypes through physical manipulation of growth of apical and lateral buds in 10 genotypes over 2 consecutive years to elucidate the nature of influence of branches and their nodal position on yield and yield attributes. A productive branching pattern might be genetically manipulated in future.

The experimental materials comprised 10 genotypes of sesame grown in split-plot design with 3 replications at District Seed Farm, Bidhan Chandra Krishi Viswavidyalaya, Kalyani, Nadia, West Bengal during 2005 and 2006. The main plot comprised different genotypes and sub-plots comprised 4 different structural ideotypes. The structural ideotypes were constructed by physically manipulating developing meristem. T₀, (control), where the plants were allowed to branch naturally; T₁, only 2 lateral branches were allowed to grow and others were removed to get a plant having only 2

branches; T₂, the main apex was removed at 6-leaf stage to promote lateral branching, T₃, the lateral branches of the plant were removed as soon as they appeared to get a plant having single stem.

Each sub-plot consisted of one row of 2.5 m length and row-to-row and plant-to-plant distances were kept 30 cm and 10 cm, respectively. Observations were recorded from 10 competitive plants on plant height, number of capsule/plant, 1000-seed weight and seed yield/plant from each treatment.

Plant architecture showed significant variations for plant height and number of capsules only (Table 1). Plant height and number of capsules/plant were influenced appreciably by different architectural forms as compared to control (Table 1). There was an increase in plant height in 2 branches and single stem form in comparison to control and top removal. Number of capsules/plant in top removal treatment was comparable to the control while, in 2 branches it was lower than control and in single stem treatment it was lowest in comparison to all the treatments including control. Thousand-seed weight and seed yield/plant did not differ significantly from the control in any of the treatments but single stem treatment registered numerically higher value for 1000-seed weight and lowest value for seed yield/plant among all the treatments. Genotypes differed significantly for all the traits studied. Among the genotypes 'B 9' and 'L 47' gave high seed yield over all architecture forms in comparison to other genotypes.

Significantly higher 1000-seed weight was recorded in all the genotypes except 'B 9' in single stem treatment as compared to control (Table 1). Thousand seed weight in general was recorded significantly lower in comparison to control is most of the genotypes in top removal treatment excepting 3 genotypes which were comparable. While 3 genotypes ('L 47', 'B 9' and 'B 67') gave significantly higher seed yield than the respective control. In 2 branching treatment, genotypes, like 'L 47', 'L 27', 'L 18' and 'B 9' recorded significantly higher seed yield than the control and 4 genotypes ('HT 1', 'L 27', 'L 19-2' and 'B 67') gave

Short note*

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Table 1 Effect of different plant architectures and interactions of genotypes on different traits (pooled)

Plant architecture	Plant height (cm)		Capsules per plant		1000-seed weight (g)		Seed yield/plant (g)	
Control (T ₀)	84.2		38.6		2.90		3.26	
Two branches (T ₁)	89.1		36.9		2.91		3.28	
Top removal (T ₂)	85.4		38.9		2.81		3.26	
Single stem (T ₄)	89.6		25.4		3.02		2.80	
CD (<i>P</i> < 0.05)	0.89		0.86					

Genotype	Plant architecture							
	Control (T ₀)		Two branches (T ₁)		Top-removal (T ₂)		Single stem (T ₃)	
	SW	SY	SW	SY	SW	SY	SW	SY
'L47'	2.92	3.79	2.82*	5.13	2.84*	4.03**	3.03**	3.30*
'B 14'	2.99	3.38	2.90*	2.82*	2.87**	3.22a	3.05**	2.24*
'PT 1'	3.26	1.94	3.26 ^a	2.02 ^a	2.95*	2.05a	3.38**	2.59**
'HT 1'	2.93	2.51	2.99**	2.34a	2.83*	1.67a	3.23**	2.74**
'L 27'	2.79	3.06	2.89**	4.26**	2.69*	3.55a	2.91**	2.74**
'L 18'	2.74	4.01	2.76a	4.41**	2.77 ^a	3.51*	2.86**	2.97*
'L 39 2'	2.54	2.77	2.61**	2.50**	2.46*	1.87*	2.68**	2.12*
'B 9'	3.19	4.06	3.15a	4.40**	3.14 ^a	6.31**	3.24 ^a	3.31*
'B 67'	2.87	2.37	2.95**	2.09*	2.89 ^a	2.89**	3.03**	2.84**
'Rus-17-4'	2.79	4.14	2.79a	2.89*	2.69*	3.52*	2.83**	2.71*
CD (<i>P</i> = 0.05)	0.05	0.21						

*, lower; and **, higher respectively; ^a, not significantly different from control. SW, 1000 seed weight; SY, seed yield/plant.

Table 2 Branching node, number of branches and seed yield of different genotypes in different plant architecture

Branching Node	Genotype	Number of Branches		Seed yield			
		T ₀	T ₂	Control (T ₀)	Two branches (T ₁)	Top removal (T ₂)	Single stem (T ₃)
2nd node	'PT 1', 'HT 1'	2.3	2.3	2.19	2.20	1.86	2.80
2nd/3rd node	'L 26', 'L 39 2', 'B 67', 'Rus 17 4'	2.7	2.9	3.18	2.95	2.94	2.83
3rd/4th node	'L 47', 'B 14', 'L 18', 'B 9'	2.9	3.2	3.82	4.16	4.36	3.03

significantly higher 1000-seed weight than respective control, out of remaining 6, 4 were comparable, while, 2 genotypes recorded lower values in comparison with control. Three genotypes ('PT 1', 'HT 1' and 'B 67) recorded significantly higher seed yield/plant in the single stem treatment while the rest recorded significantly lower seed yield/plant as against control. All the genotypes except 'B 9' also recorded significantly higher 1000-seed weight but lower number of capsules/plant. Genotypes having shorter height (70–80 cm) tended to produce lower number of capsules/plant and gave lower yield even with higher 1000-seed weight. However, among the tall genotypes having more number of capsules produced higher seed yield when accompanied with higher 1000-seed weight.

The 10 genotypes included in this present experiment were further tested for their branching node, number of branches and seed yield. Genotypes differed in their branching node

(Table 2). Two genotypes produced branches normally from the second node while, 2 groups of 4 genotypes produced branches from second and third node and third and fourth node, respectively. Last two groups of genotypes did not differ in their number of branches in the control. Second nodal branching genotypes recorded significantly higher seed yield in single stem treatment as against others when compared with control. While third and fourth nodal branching genotypes recorded significantly higher seed yield in 2 branches and top removal treatment in comparison with control.

The study reveals the genotypes behave differently with different branching architecture but single stem or non-branching treatment significantly reduced number of capsules/plant. In single stem treatment main raceme could not compensate the loss of capsules due to non-availability of branches. Baydar (2005) emphasized the need of branches

for higher-yielding plant type than non-branching type. Using higher plant density with high fertility and management, yield might be increased in single stem ideotype in sesame by reducing inter-plant competition. Genotypes which outyielded the respective control in single stem treatment invariably recorded higher 1000-seed weight indicating the existence of intra-plant competition in these genotypes. Although single stem as a treatment recorded lowest seed yield among the architectural forms (Table 1), 2 genotypes proved to be higher yielder which emphasizes the importance of this architectural form to achieve higher yield if manipulated genetically. Three genotypes ('L 47, 'B 9' and 'B 67') outyielded the control in top removal treatment of which 'B 9' recorded almost 50% more yield as compared to control. This genotype had the genetic ability to produce more branches and being encouraged by detopping produced highest yield among all the genotypes in the top removal treatment. But in top removal treatment number of branches gradually increased as the nodal position of branching was increased. The genotypes with third and fourth nodal branching recorded higher seed yield/plant than the second nodal branching genotypes in all the treatments including control. So removal of extra lateral branches (2 branches) or detopping (top removal) in third and fourth nodal branching

genotypes proved to be superior, and therefore genetic control for the same may be sought after.

SUMMARY

The experiment was conducted during 2005 and 2006 to study the influence of different structural ideotypes from single stem to numerous branches in sesame (*Sesamum indicum* L.) to achieve an ideal plant type. Ten genotypes of sesame were tested by surgically manipulating the growth of the meristem to construct single stem, two branches and numerous branches along with the control (no manipulation). Plant architecture showed significant variation for plant height and number of capsules/plant only, while, genotypes showed significant variations for plant height, number of capsules/plant, test weight and seed yield/plant. Third and fourth nodal branching genotypes recorded higher seed yield/plant than the second nodal branching genotypes in all the treatments including control.

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