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EXPLOITATION OF POLYCROSS VARIATION AND EARLY STAGE SELECTION CRITERIA IN RAMIE

O. P. TUTEJA* AND S. L. AHUJA

Ramie Research Station (ICAR), Sorbhog, Dist. Barpeta, Assam 781317

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ABSTRACT

Open-pollinated population of 20 ramie (*Boehmeria nivea* L. Gaud.) genotypes differed significantly for morphological traits, number of nodes/plant, internode length, plant height, lower, middle and upper stem diameters, and root and shoot length. None of the morphological traits showed significant positive association with seed size and shoot length. Root length had significant positive association with seed size and short length. Root length had significant association with number of nodes and plant height, which itself had strong association with fibre yield. Plant characters like number of nodes, plant height, lower, middle and upper stem diameters had positive association amongst themselves as well as with yield. Three genotypes, R 1414, R 1420 and R 67-34, possessing high variation for morphological traits may be preferred to exploit resultant recombinations. Selection for longer root length of germinating seedlings will be helpful in improvement for fibre yield and its components.

Key words: Polycross, early selection, fibre quality, ramie. *Boehmeria nivea*.

Ramie (*Boehmeria nivea* L. Gaud.) can be propagated sexually as well as asexually. Sexual reproduction is done to obtain new genetic recombinants in breeding nurseries, as the crop is cross-pollinated (monoecious). Asexual propagation is preferred over sexual reproduction in commercial cultivation for rhizomes and fibre due to its advantage in maintenance of genetic purity. In the materials generated through sexual reproduction, seed vigour tests can predict adult plant performance under a wide range of field conditions [1]. Selection is more economical if carried out at seedling stage. Due to lack of information on this aspect in ramie, experiments were conducted in which out-cross populations were raised through seed to study fibre yield and component traits and to fix criteria for selection of genotypes at early seedling stage.

*Present address: Central Institute for Cotton Research, Regional Station, Sirsa 125055.

MATERIALS AND METHODS

Seeds from 20 open-pollinated genotypes of ramie were collected and divided into two parts to conduct the following experiments.

(i) Polycross progenies of 20 genotypes under study were raised in nursery beds. After 60 days, 100 seedlings of each genotypes were transplanted at 60 x 30 cm spacing. Staging of the crop was done 60 days after transplanting and observations recorded for number of nodes, internode length, plant height, lower, middle and upper stem diameters. After the staging of the crop, observations were recorded after 50 days for each cut. Total three cuttings were taken. Variance for each character of a genotype in each cut was computed and averaged to observe extent of variability.

(ii) One hundred polycross seeds from each of the 20 genotypes were germinated on moist filter paper in Petri dishes in an incubator at $30 \pm 2^{\circ}C$ in three repeats. Data on shoot and root length were recorded on 30 seedlings 15 days after the seeds were placed on filter paper. Variances for root and shoot length of each genotype in each experiment were calculated. Corresponding variances of three experiments were averaged to assess the extent of variability. Rank correlations of shoot and root length among themselves as well as with morphological traits were calculated.

RESULTS AND DISCUSSION

The extent of variation for various traits among individual plants of 20 genotypes is presented in Table 1. The genotypes differ considerably from each other in their variance for a particular character, indicating the possibility of selecting better individual plants for desirable traits. Five genotypes with higher variance for the traits under study in descending order are presented in Table 2. Genotype R 1414 showed high variation for all the traits; R 1413 for shoot and root length. Other genotypes showing high variation for various traits were: R 1416 for internode length; R 1419 for nodes/plant, plant height and upper stem diameter; R 1420 for middle and upper stem diameters and root length; R 1425 for root length; R 1427 for upper stem diameter; R 1438 for internode length and middle stem diameter; R 67-34 for plant height, lower stem diameter, shoot and root length; R 67-46 for number of nodes, internode length and middle stem diameter; R 67-46 for number of nodes, internode length and middle stem diameter; R 67-51 for plant height and lower stem diameter; and cv. Hakuhi for shoot length only.

Thus the genotypes R 1413, R 1416, R 1419, R 1425, R 1438, R 67- 46, R 67-51 and cv. Hakuhi carry high variability only for morphological traits, whereas the genotypes R 1414, R 1420 and R 67-34 had high variability for morphological as well as seedling traits. Hence latter three genotypes are of greater importance for selection both at early and later stages of plant development. Importance of plant height and stem diameter for fibre yield in ramie has been reported earlier [2]. Scharonoff [3] suggested to exercise selection for nodes per stem in ramie to breed for fibre yield.

Table 1. Variance averaged over three cuttings of different characters in ramie

Genotype	Nodes/stem	Internode length	Plant height	Lower stem diameter	Middle stem diameter	Upper stem diameter	Shoot length	Root length
R 1412	9.0	3.50	253.8	0.028	0.020	0.008	3.02	2.55
R 1413	11.8	3.40	290.7	0.022	0.024	0.005	10.63	7.31
R 1414	22.4	5.53	435.9	0.080	0.088	0.023	4.46	3.09
R 1416	40.7	7.75	72.6	0.017	0.028	0.005	2.99	3.38
R 1418	14.9	3.61	277.6	0.028	0.015	0.004	8.18	4.06
R 1419	26.2	5.04	368.6	0.021	0.015	0.016	3.74	4.24
R 1420	9.6	3.30	266.8	0.032	0.083	0.012	5.29	9.79
R 1422	8.7	5.35	278.9	0.024	0.018	0.007	5.22	6.85
R 1427	13.2	2.29	233.6	0.030	0.001	0.011	5.77	6.29
R 1438	15.5	6.22	318.0	0.014	0.055	0.002	6.56	3.81
R 1447	18.5	3.31	195.4	0.017	0.032	0.005	9.94	6.64
R 1449	29.4	8.29	632.5	0.035	0.032	0.007	2.40	3.19
R 1450	77.3	1.83	373.9	0.025	0.129	0.008	8.25	6.18
R 67-20	14.8	3.80	228.0	0.028	0.019	0.004	2.10	1.35
R 67-34	13.7	4.32	393.8	0.043	0.022	0.001	10.33	9.33
R 67-46	23.1	5.75	109.0	0.009	0.070	0.011	4.97	1.79
R 67-51	14.8	3.34	378.2	0.044	0.028	0.013	7.80	2.69
Hakuhi	15.4	3.02	340.1	0.020	0.016	0.011	12.77	5.89
Saikeshin	9.4	3.70	130.4	0.018	0.027	0.001	7.90	1.18
SE	3.5	0.38	28.5	0.003	0.007	0.001	0.69	0.58
CD 1%	9.9	1.10	81.5	0.009	0.021	0.003	1.97	1.66

Correlation coefficients among the morphological and seedling traits showed that none of the morphological traits had significant positive association with seed size and shoot length (Table 3). Root length had significant positive association with number of nodes and

Table 2. Five genotypes of ramie arranged in descending order of variance for different characters

Nodes/stem	Internode length	Plant height	Lower stem diameter	Middle stem diameter	Upper stem diameter	Shoot length	Root length
R 1416	R 1449	R 1449	R 1414	R 1414	R 1414	Hakuhi	R 1420
R 1449	R 1416	R 1414	R 67–51	R 1420	R 1419	R 1413	R 67–34
R 1419	R 1438	R 67–34	R 67–34	R 67–46	R 1420	R 67–34	R 1413
R 67-46	R 67–46	R 67–51	R 1449	R 1438	R 1427	R 1447	R 1425
R 1414	R 1414	R1419	R 1420	R 1449	R 67–46	R 1450	R 1447

Table 3. Rank correlations among different characters in ramie

Character	Nodes/ stem	Inter-node length	Plant height	Lower stem diameter	Middle stem diameter	Upper stem diameter	Shoot length	Root length	Fibre yield/ cane
Seed size	0.39	0.29	0.32	0.20	0.26	0.27	0.76**	0.57**	0.28
Nodes/stem		0.31	0.89**	0.83**	0.75**	0.36	0.16	0.41*	0.59**
Internode length			0.38	0.28	0.48*	0.80**	0.27	0.29	0.31
Plant height				0.84**	0.89**	0.42*	0.17	0.44*	0.60**
Lower stem diameter					0.76**	0.34	0.04	0.23	0.68**
Middle stem diameter						0.60**	0.03	0.34	0.54*
Upper stem diameter							0.10	0.06	0.48*
Shoot length								0.74**	0.05
Root length									0.28

* P = 0.05, ** P = 0.01.

plant height, which, in turn, had significant positive association with fibre yield. It was interesting to note that the seedling characters have significant positive association among themselves. Similarly, the morphological traits, number of nodes, plant height, lower, middle and upper stem diameters had significant posiive correlation with fibre yield as well as amongst themselves. These results, indicate that to achieve improvement for fibre yield and its components, selection can be done on the basis of longer roots of the germinating seedlings.

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