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Short Communication

APPLICATION OF INDEX SCORING METHOD FOR SELECTION OF MULBERRY GENOTYPES

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In mulberry (*Morus* spp.) which is sole food plant of silkworm, breeding objectives are mainly concentrated on qualitative and quantitative improvement of foliage in contrast to fruit trees. With a view to select potential parents, 60 accessions of mulberry from diverse origin were evaluated for propagation, foliage yield and quality parameters. In the present study, for selection of promising genotypes, index scoring method was used where the index values are determined by Euclidian distance. Based on index values, 10 genotypes were selected as potential parents over checks.

Key words: Mulberry, evaluation, index scoring method

The objectives of breeding mulberry (*Morus* spp.) are mainly concentrated on the quantitative and qualitative improvement of foliage in contrast to fruit trees and cereals. Since mulberry is a perennial crop grown under varied agro- climatic conditions, cultivation of high yielding strains with good quality leaf and adaptability to specific regions is the cheapest and long standing method to realize higher income. To meet the above breeding objectives, large scale and long term breeding programmes are necessary for which adequately conserved broad spectrum genetic variability is a pre-requisite. The conserved germplasm genotypes need to be evaluated for identifying potential parents for successful hybridization. In the present study, the exotic genotypes were evaluated for different unrelated characters and potential parents have been identified using Index scoring method.

Germplasm genotypes of various geographical origin maintained at CSR&TI, Mysore were used for the study. Among the 60 exotic genotypes evaluated, maximum of 26 were from Japan, five accessions were from Pakistan, four from Indonesia, four from Paraguay, three from China, three from Bangla Desh, two from Italy, two from France, one from USSR, one from Burma and 10 exotic accessions (origin not known). 60 accessions maintained as high bushes at 45 cm height under 1.5 × 1.5 m spacing were used for the study and recommended package of practices for irrigated mulberry (Krishnaswamy, 1978) were followed. Observations on propagation, growth yield and quality parameters like sprouting, rooting, plant height, number of branches, internodal distance, weight of 100 fresh leaves, area of 100 leaves and moisture percentage were recorded following the methods suggested by Jolly and Dandin (1986).

For analysis of the data on various unrelated parameters, Index scoring method was followed as suggested by Barreto and Raun (1991) of International wheat and Maize improvement Centre (CIMMYT), Mexico. The programme computes a variable called 'INDEX' which

Table 1. Genotypes of different geographic origin included in the study

Origin	Names of genotypes/Acc. No.
Japan	Kosen, KNG, Kairyoroso, Mizusawa, Tsukasagawa, Goshoerami, Kokuso-27, Roso, Kenmochi, Kokuso-21, Ichihei, Katania, Roko-kuyaso, Ensatakasuke, Shimanochi, Kokuso-20, Atsubamidori, Okinawa, Kasuga, Togowase, Acc. 167, Ichinose, Limoncina; Shin-ichinose, Senmatsu, Tomeisc.
China	China white, China peking, MR-1
Pakistan	PKS-1-12, PKS-1-11, PKS-1-9, PKS 1-4, PKS-1-2
Indonesia	*M. australis, M. multicaulis, M. nigra,M. cathayana*
Paraguay	Ferno-dias, Calabresa, Paraguay, Miuraso
Bangladesh	Shrim-2, Shrim-5, Shrim-8
Italy	Cattaneo, Italian sarnal
France	English black, France
USSR	Sannish-5
Burma	Burma-8
Exotic	Acc. 107, Acc. 116, Acc. 123, Acc. 134, Acc. 135, Acc. 148, Acc. 151, Acc. 152, Acc. 165

mathematically incorporates all the characters indicated by the user's objective. The best genotype is the one that has the smallest index value and closely relates with the desired objectives.

The genotypes included in the study and their place of collection is presented in Table 1. The data on maximum, minimum, average values and CV% of different parameters is presented in Table 2. The i ndex values along with the different parameters of the top 10 genotypes selected by index scoring method are presented in Table 3.

The sprouting percentage ranged from 0.00 to 97.00 per cent average being 41.744 per cent the rooting percentage ranged from 0.00 to 96.67 per cent average value being 33.705 per cent. Plant height varied from 32.40 cm to 207.40 cm with an average value of 115.103 cm. Number of branches ranged from 2.00 to 36.00 with an average value of 13.852. The minimum internodal distance recorded was 2.25 cm and the maximum was 7.69 cm, the average value being 4.411 cm. Weight of 100 fresh leaves ranged from 101.69 g to 896.00 g with an average value of 355.189g. Area of 100 leaves ranged from 4781.00 cm^2 to 34200.00 cm^2 with an average value of 13035.180 cm^2. Moisture percentage ranged from 60.81 to 78.09 with an average value of 73.62%. The variability was maximum for rooting character (104.80%) followed by sprouting (86.81%) and number of branches (58.75). The variability in weight of fresh leaves and leaf area was almost same (38.09% & 38.07% respectively). The variability for plant height and internodal distance were 34.48% and 22.01% respectively. The variability was lowest (4.27%) for moisture percentage.

Table 2. Maximum, minimum, average values and CV% for different parameters

Parameter	Maximum	Minimum	Average	St. dev.	CV %
Sprouting (%)	97.00	0.00	41.744	36.239	86.81
Rooting (%)	96.67	0.00	33.705	35.324	104.80
Plant height (cm)	207.40	32.40	115.103	39.692	34.48
No. of branches	36.00	2.00	13.853	8.138	58.75
Int. distance (cm)	7.69	2.25	4.411	0.971	22.01
Weight of 100 fresh leaves (g)	896.00	101.69	355.189	135.308	38.09
Area of 100 leaves (g)	34200.00	4781.00	13035.180	4963.674	38.07
Moisture (%)	78.09	60.81	73.621	3.142	4.27

Table 3. Listing of top genotypes selected by index scoring

Name of the genotype	Origin	Index value	Sprouting (%)	Rooting (%)	Pl. ht. (cm)	No. Branches	Int. distance (cm)	Fr.wt. of 100 leaves (g)	Area of 100 leaves (cm^2)	Moisture (%)
Mizusawa	Japan	17.2	90.00	80.00	149.80	28.0	5.50	580.80	20889.0	72.86
English Black	France	17.7	57.54	95.40	105.80	36.0	4.19	455.00	13987.0	74.05
Kairyo roso	Japan	18.2	84.60	79.50	136.40	15.0	4.01	406.98	16185.0	74.50
Miuraso	Paraguay	18.6	83.00	85.00	207.40	23.0	5.43	355.57	14061.0	75.33
M. multicaulis	Indonesia	19.1	23.30	76.67	143.80	10.0	5.16	896.00	34200.0	74.80
China peking	China	19.3	42.90	40.90	129.80	28.0	5.00	393.55	16036.0	74.90
Shrim-5	Bangladesh	19.4	97.00	83.00	193.60	32.0	5.68	281.47	12100.0	75.98
MR-1	China	19.7	66.00	66.00	109.50	19.0	6.23	693.00	28230.0	73.66
Kosen	Japan	19.7	10.00	10.00	119.70	28.0	4.53	490.17	16690.0	74.29
China White	China	19.9	96.60	89.70	131.80	20.0	4.33	322.17	13956.0	71.99

In mulberry the main aim is to increase the leaf yield, improve leaf quality and bolster the resistance against disease or climatic hazards (Hazama, 1967). This can be achieved through various ways and the most successful one being hybridization among desirable parents and selection of superior hybrids. The tropical mulberry genotype have been endowed with good rooting, growth and yield characters but are medium or poor in quality parameters. On the other hand, the temperate genotypes show medium yield and good quality but are poor in rooting and growth characters. For combining these desirable traits in the progeny through hybridization, identification of potential parents is the first step. As mulberry is vegetatively propagated, once a desirable genotype is obtained it can be multiplied without any segregation.

While selecting a mulberry genotype many unrelated characters have to be considered to arrive at a conclusion as to the superiority of a genotype. Different parameters like propagation, growth, yield and quality are involved in the present study. Values of some of the attributes need to be high and some low, for judging the superiority of the genotype. When selection is made separately for different attributes no single common genotype would appear to be listed hence rendering it difficult for the breeder in selection procedure. Under such a condition, a comparative assessment irrespective of quantitative or qualitative character has to be made and index scoring method was found to be more suitable method. Based on the index scoring values, top 10 genotypes viz., Musizawa, English Black, Kairyo roso, Miuraso, M. multicaulis, China peking, Shrim - 5, MR-1, Kosen and China white were selected. Of the 10 genotypes selected, three were from Japan, three from China, one from France, one from paraguay and one from Bangladesh. These 10 genotypes have been identified as potential exotic parents for future hybridization programmes in mulberry.

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