Improvement Index Method to Isolate Superior Cotton Variety

R. L. Joshi*

ABSTRACT

In crop improvement programme, breeder has to study large number of varieties/cultures with number of economic characters, some of which are more important to others according to the objective of evolving a particular crop type suitable for a particular agroclimatic conditions. No method is available to evaluate, isolate and give merit number on the basis of overall performance of each variety/culture under study. In the present paper a method is described which evaluates, isolates and enables the breeder to give merit number to each variety under study. Application of the method can also be extended for other crops as well.

INTRODUCTION

IN COTTON, characters like yield, ginning out-turn, mean fibre length, length uniformity ratio, fibre fineness, maturity coefficient, fibre strength, earliness, resistance to black arm, jassid and boll-worm etc., are to be studied. Some pairs of characters in cotton are positively correlated, whereas other pairs of characters are negatively correlated. In positively correlated characters, the improvement in all characters is simultaneous but in negativcly correlated characters, the improvement in one character may be at the cost of another negatively correlated character. It would, therefore, be difficult for a breeder to detect marginal overall improvement in a new variety under study as compared to control.

Every trial is conducted to achieve some specific objectives. The objective may be high yield, high ginning out-turn, extra long staple, good fibre strength, resistance to pest and diseases etc. If a breeder would conduct a trial to isolate high yielding variety he would give more pressure to yield in his selection cycle. If a breeder would conduct a trial to isolate pest and disease resistant variety, he would give more pressure to pest and disease resistance in his selection cycle. Before conducting a trial, a breeder must have clear-cut idea in his mind regarding number of character to be studied and amount of pressure to be applied to each character in his selection cycle to isolate a few best varieties under study.

METHODS

For illustration, data collected from coordinated varietal trial (*G. hirsutum* L.) conducted at Agricultural Research Station, Talod (Gujarat) during 1973-74 were taken. Three characters viz., yield, ginning out-turn and mean fibre

*Cotton Breeder, Gujarat Agricultural University, Talod, (Sabarkantha).

length were taken into account to isolate a few best varieties from 14 varieties of different States under trial. Yield, ginning out-turn and mean fibre length were given 50 per cent, 30 per cent and 20 per cent weightage, respectively. Therefore, pressure index for yield, ginning out-turn and mean fibre length were worked out to be 0.50, 0.30 and 0.20, respectively.

The improvement index was worked out as under:

$$I\,I = RN \times P\,I$$

Where I I is the improvement index, R N is the rank number and P I is the pressure index.

TABLE—I

Coordinated verietal trial (*G. Hirsutum L.*) conducted at Talod during 1973-74.

	Yield of seed cotton			*Ginning out turn*			*Mean fibre length*			*Total of I.I.*	*over-all rank number*	*Merit number*
	kg/ha	*R.N.*	*I.I.*	*%*	*R.N.*	*I.I.*	*mm*	*R.N.*	*I.I.*			
IAN 4705	1238	8	4.0	31.4	8	2.4	26.9	9	1.8	8.2	6	7
IAN 4757	1469	4	2.0	33.1	4	1.2	30.5	1	0.2	3.4	1	2
IAN 6074	1847	2	1.0	32.0	7	2.1	30.0	2	0.4	3.5	2	3
IAN 11.1	1435	5	2.5	35.5	1	0.3	28.4	6	1.2	4.0	4	5
J—1616	1363	6	3.0	33.9	3	0.9	29.7	3	0.6	4.5	5	6
IAN—80	995	13	6.5	30.1	10	3.0	30.5	1	0.2	9.7	10	12
DHY—286	1228	10	5.0	32.1	6	1.8	27.9	8	1.6	8.4	8	10
66BH 5/91	1161	11	5.5	29.9	12	3.6	29.2	4	0.8	9.9	11	13
69BH 29/6	717	14	7.0	34.2	2	0.6	28.2	7	1.4	9.0	9	11
70 IH—452	1471	3	1.5	32.8	5	1.5	29.2	4	0.8	3.8	3	4
C.P. 25/1	1264	7	3.5	29.2	14	4.2	29.7	3	0.6	8.3	7	8
M.C.U. 5	1230	9	4.5	30.0	11	3.3	29.7	3	0.6	8.4	8	9
IAN 579/188	1933	1	0.5	30.7	9	2.7	30.5	1	0.2	3.4	1	1
Deviraj (control)	1050	12	6.0	29.4	13	3.9	29.0	5	1.0	10.9	12	14

SE	105
CD	299
CV	8

Pressure Index for yield —0.50
For ginning percentage —0.30
For fibre length —0.20
mm —*Mili meter*

From Table 1, it is seen that character-wise rank numbers were given to all 14 varieties under trial. If the value of a particular character is same for more than one varieties, all such varieties would get same rank number. The best variety for a given character scored first rank in that particular character. Sum total of pressure index is one which was divided among number of characters to be studied on the basis of the pressure to be applied to each character in a selection cycle. The calculation of improvement index is self explanatory.

It is the multiplication of rank number and pressure index. The improvement index, for each variety were summed up under the column of total improvement index. The overall rank was given to each variety. The variety scored lowest value of total improvement index was given first merit number and one which scored highest value of total improvement index was given last merit number.

RESULTS AND DISCUSSION

From Table 1, it is seen that with the help of this method, out of 14 varieties, following six best varieties were isolated and listed according to thier merit.

Merit number	*Variety*	*Source of seed*
1	IAN-579/188	Gujarat (Surat)
2	IAN-4757	Gujarat (Surat)
3	IAN-6074	Gujarat (Surat)
4	70IH-452	M.P. (Indore)
5	IAN-11-1	Gujarat (Talod)
6	J-1616	Gujarat (Junagadh)

If overall rank number is same for two or more varieties, then merit number is given according to the performance in the character of highest weightage (in this case yield). For example, IAN-579/188 and IAN-4757 were getting same overall rank number, then IAN-579/188 was given first merit number on the basis of its better yield performance to IAN-4757. According to merit the control *Deviraj* stood last.

In replicated trials, statistical analysis may be carried out and varieties which turned out to be significantly superior in yield of seed cotton over control may be subjected to improvement index method to isolate a few best varieties. Such selected varieties may be given for district trials to evaluate their merit on cultivators' field. Even in nonreplicated trial, one could take any number of characters with any number of varieties/ cultures in any crop and apply this method to isolate a few best varieties/ cultures from the trial he has conducted.

Once the objective is fixed, this method would give similar results in the hands of different research workers. This method would eliminate all known and unknown bias working in the mind of research workers. Merit of the variety would only change, if there would be change in the objective of evolving a new crop type.

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