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Index Selection for Varietal Improvement in Linseed (*Linum usitatissimum* L.)

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Yield of a crop is a complex quantitative character influenced by environmental fluctuations. Therefore, direct selection for yield as such will not be very reliable. Hence selection criterion based on yield components would be helpful in selecting suitable plant types. A knowledge of interrelationships between yield and components and the relative weightage which should be given to different yield components to obtain maximum gain is, therefore, most important.

Discriminant function analysis developed by Fisher (1936) and firstly applied by Smith (1936) gives the information of proportionate weight that should be given to a particular yield component. This technique has been adopted by Sikka and Jain (1958) in wheat, Badwal *et al* (1970) in linseed, Mani (1974) in brown sarson and Tikka *et al* (1977) in lentil. This communication purports to report the findings of such an investigation in linseed.

The details of the material and lay-out of the experiment are earilier reported by Tikka *et al* (1972) and Dayal *et al* (1975). The selection indices were constructed and the genetic advance calculated on the basis of the method suggested by Robinson *et al* (1951) with the help of phenotypic and genotypic variances and co-variances.

Sixty two selection indices were constructed in all possible combinations of five yield contributing characters and yield. These characters were capsules/plant (X1), primary branches (X2), plant height (X3), days to maturity (X4), test weight (X5) and yield/plant (X6). The selection indices are presented in Table 1.

All the indices, not based on seed yield/plant were inferior to direct selection for yield. However, indices based on capsules/plant, primary branches, plant height and test weight had relative efficiency approaching to 100 (98·32%). This indicated that fruitful gain would not be possible without considering seed yield as one of the component of selection index. Relative efficiency in the indices which had seed yield as one of the component ranged from 54·79% to 124·53%. Selection index based on capsules/plant, primary branches, plant height, test weight and seed yield which had highest relative efficiency (124·53%) was most suitable to obtain the maximum gain.

All the indices which had high value of relative efficiency had capsules/plant

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TABLE 1

Selection indices in linseed.

S.No.	Selection index	Genetic advance	Relative efficiency (%)
1.	2.	3.	4.
1.	0·010 X1	0·616	47·981
2.	0·021 X2	0·704	54·774
3.	0·006 X3	0·066	5·134
4.	—0·078 X4	0·662	51·844
5.	0·040 X5	0·120	9·778
6.	0·618 X6	1·285	100·000
7.	—0·101 X1 + 0·402 X2	0·073	56·553
8	0·010 X1 + 0·009 X3	0·624	48·577
9.	0·010 X1 — 0·078 X4	0·916	71·281
10.	0·010 X1 + 0·016 X5	0·619	48·136
11.	0·002 X1 + 0·653 X6	1·289	100·374
12.	0·223 X2 — 0·003 X3	0·704	54·827
13.	0·183 X2 — 0·062 X4	0·875	68·135
14.	0·225 X2 + 0·054 X5	0·723	56·318
15.	0·006 X2 + 0·617 X6	1·285	100·000
16.	0·007 X3 — 0·078 X4	0·670	52·157
17.	0·004 X3 + 0·038 X5	0·133	10·383
18.	0·003 X3 + 0·617 X6	1·285	100·000
19.	0·079 X3 + 0·054 X5	0·688	53·517
20.	0·029 X4 + 0·576 X6	1·307	101·696
21.	0·006 X5 + 0·617 X6	1·285	100·013
22.	—0·018 X1 — 0·549 X2 — 0·021 X3	0·748	58·226
23.	0·035 X1 + 0·480 X2 — 0·122 X4	0·956	74·359
24.	—0·024 X1 + 0·672 X2 + 0·139 X5	0·805	62·679
25.	0·018 X1 + 0·308 X2 + 0·639 X6	1·323	102·940
26.	0·011 X1 + 0·009 X3 — 0·079 X4	0·922	71·753
27.	0·010 X1 + 0·009 X3 + 0·011 X5	0·625	48·643
28.	0·002 X1 + 0·002 X3 + 0·652 X6	1·290	100·392
29.	0·010 X1 — 0·079 X4 + 0·030 X5	0·921	71·656
30.	0·001 X1 — 0·028 X4 + 0·595 X6	1·308	101·769
31.	—0·002 X1 + 0·009 X5 + 0·653 X6	1·290	100·402
32.	0·184 X2 — 0·007 X3 — 0·062 X4	0·876	68·138
33.	0·228 X2 — 0·006 X3 + 0·057 X5	0·726	56·531
34.	—0·001 X2 + 0·003 X3 + 0·618 X6	1·285	100·034
35.	0·187 X2 — 0·063 X4 + 0·063 X5	0·897	69·840
36.	—0·003 X2 — 0·029 X4 + 0·579 X6	1·307	101·699
37.	0·002 X2 + 0·006 X5 + 0·616 X6	1·285	100·013
38.	0·004 X3 — 0·078 X4 + 0·052 X5	0·689	53·629
39.	0·004 X3 — 0·029 X4 + 0·575 X6	1·307	101·738
40.	0·003 X3 + 0·046 X5 + 0·617 X6	1·286	100·039
41.	—0·030 X4 + 0·014 X5 + 0·573 X6	1·308	101·754
42.	—0·276 X1 + 5·576 X2 — 0·306 X3	Abandoned (—ve G.A)	
43.	—0·181 X1 + 3·624 X2 — 0·237 X3 + 0·825 X5	1·263	98·316
44.	—0·026 X1 + 0·471 X2 — 0·024 X3 + 0·641 X6	1·338	104·097
45.	0·121 X1 — 2·127 X2 — 0·262 X4 — 0·326 X5	1·035	80·554
46.	—0·024 X1 + 0·425 X2 + 0·017 X4 + 0·669 X6	1·325	103·076
47.	—0·028 X1 + 10·510X2 + 0·103 X5 + 0·627 X6	1·347	104·825

TABLE 1 (Contd.)

1.	2.	3,	4.
48.	0·010 X1 + 0·008 X3 — 0·079 X4 + 0·025 X5	0·925	71·997
49.	—0·002 X1 + 0·002 X3 + 0·009 X5 + 0·652 X6	1·290	100·413
50.	—0·001 X1 — 0·028 X4 + 0·015 X5 + 0·593 X6	1·309	101·837
51.	0·189 X2 — 0·004 X3 — 0·063 X4 + 0·065 X5	0·899	69·627
52.	—0·006 X2 + 0·004 X3 — 0·029 X4 + 0·579 X6	1·307	101·745
53.	—0·004 X2 + 0·003 X3 + 0·046 X5 + 0·617 X6	1·286	100·039
54.	—0·002 X2 — 0·030 X4 + 0·014 X5 + 0·574 X6	1·308	101·754
55.	0·003 X3 — 0·030 X4 + 0·012 X5 + 0·574 X6	1·308	101·782
56.	—0·009 X1 + 0·376 X2 — 0·017 X3 — 0·047 X4 + 0·104 X5	0·890	69·276
57.	0·031 X1 — 0·577 X2 + 0·037 X3 — 0·010 X4 + 0·473 X6	1·289	100·367
58.	—0·167 X1 + 3·156 X2 — 0·211 X3 + 0·718 X5 + 0·517 X6	1·600	124·530
59.	0·522 X1 — 9·496 X2 — 0·974 X4 — 1·539 X5 — 0·926 X6	0·704	54·794
60.	0·001 X1 + 0·002 X3 — 0·028 X4 + 0·014 X5 + 0·592 X6	1·309	101·856
61.	—0·004 X1 + 0·003 X3 — 0·030 X4 + 0·012 X5 + 0·576 X6	1·307	101·784
62.	0·010 X1 — 0·204 X2 + 0·017 X3 — 0·049 X4 — 0·028 X5 + 0·533 X6	1·300	101·190

Where: X1 = Capsules/plant
X2 = Primary branches
X3 = Plant height
X4 = Days to maturity
X5 = Test weight
X6 = Seed yield/plant

as one of the component indicating the importance of capsules/plant. Hence, this character should be considered besides seed yield/plant for phenotypic selection. Pathak and Bajpaye (1964) and Badwal *et al* (1970) have also reported that capsule number was most important selection criterion in linseed. This might be due to very high positive correlation between seed yield and capsule number. Positive and significant correlation between seed yield and capsule number has also been reported by Kedarnath *et al* (1960), Gupta *et al* (1964), Pathak and Bajpaye (1964) and Badwal *et al* (1970). It is important to note that both group of selection indices one including yield and other excluding it (with high relative efficiency) did not include days to maturity indicating that this trait was not much important for plant selection.

Therefore, from the study of selection indices through multiple regression equations for five yield components and yield in linseed, it has been revealed that index based on capsules/plant, primary branches, plant hieght, test weight and yield/plant had the highest efficiency (124·53%) and was most suitable for selection to obtain maximum gain.

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