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热带有限型和无限型大豆产量构成因素分析*

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摘要

本研究以10个有限型和10个无限型(或亚有限型)栽培大豆品种为材料，采用逐步回归方法分析了大豆产量的构成因素。试验设计为随机区组，4次重复。结果表明:单株荚数一个因素即可分别解释有限型、中间型、无限型大豆产量变异的72.80%、79.93%和80.80%。单株荚数、生育期、主茎上始花到终花的日数和株高在三种类型的品种中都是重要的产量构成因素。

COMBINSTION OF YIELD CONTRIBUTING CHARACTERS IN DETERMINATE AND INDETERMINATE SOYBEANS IN THE TROPICS

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Determinate growth habit of soybean cultivars is controlled by dt_1 gene whereas indeterminate and semideterminate growth habits are controlled by Dt_1 and Dt_2 genes respectively (Bernard, 1972). Indeterminate cultivars continue main stem elongation several weeks after beginning flowering while determinate plants terminate main stem elongation at, or soon after, the onset of flowering. As very limited work has been done to identify the best combination of yield contributing characters in determinate and semi/indeterminate types of soybean separately, an experiment was undertaken using twenty (10 determinate and 10 semi/indeterminate) popular soybean cultivars.

MATERIALS AND METHODS

The investigation was carried out at Pantnagar, India during rainy season 1989 involving 10

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determinate and 10 semi/indeterminate soybean cultivars. Soybeans were planted in a randomized block design with 4 replicatios. Individual plot consisted of 3 rows, 4 m long, spaced 60 cm apart. Plant to plant distance was maintained at about 15 cm.

The stepwise multiple linear regression equations were worked out to predict the combinations of characters by which we can get the maximum percent of variability. The sequence of entry of the variable was on the basis of forward selection procedure analysis (Draper and Smith, 1966). The first independent variable entered was the most highly correlated with the dependent variables. Subsequent independent variables were then entered in terms of magnitude of their partial correlation with the dependent variables. Entry of each variable was tested by partial F-test to see wheather the increase in the R^2 value due to that variable was significant or not.

RESULT AND DISCUSSIONS

Table 1 Stepwise multiple linear regression analysis between yield and different yield contributing characters (for determinate varieties)

	R^2	R
$Y=7.729+0.168x_{12}$	0.7280**	0.8532
$Y=-6.217+0.142x_{12}+0.259x_5$	0.8288**	0.9104
$Y=-9.304+0.138x_{12}+0.287x_5+0.951x_{13}$	0.8432**	0.9183
$Y=-6.954+0.151x_{12}+0.282x_5+1.221x_{13}-0.165x_9$	0.8610**	0.9279
$Y=-14.867+0.167x_{12}+0.261x_5+1.269x_{13}-0.180x_9+0.395x_3$	0.8770**	0.9365
$Y=-25.746+0.171x_{12}+0.234x_5+0.961x_{13}-0.163x_9+0.534x_3+0.166x_1$	0.8908**	0.9438
$Y=-23.999+0.172x_{12}+0.221x_5+0.889x_{13}-0.147x_9+0.556x_3+0.171x_1-0.138x_8$	0.8964**	0.9468
$Y=-24.102+0.174x_{12}+0.220x_5+0.803x_{13}-0.145x_9+0.894x_3+0.195x_1-0.192x_8-0.351x_4$	0.9012**	0.9493

Y = Yield
x_1 = Days to flower
x_3 = Days from to first flowering to last flowering on main stem
x_4 = Days from first flowering to last flowering on branches
x_5 = Plant height
x_8 = Nodes on main stem
x_9 = Nodes on primary branches
x_{12} = Total pods
x_{13} = Lodging
** Significant at 1% level.

Stepwise multiple linear regression analysis indicated that x_{12} (Total pods) could be used to predict the yield of determinate soybean, explaining 72.80% of variability whereas this character alone can explain 80.80% and 79.93% variability in semi/indeterminate and combined soybean cultivars respectively. This indicated that total pods per plant was an important yield component in soybean.

Pods/plant in combination with plant height (x_5), lodging (x_{13}), nodes on primary branches

(x_9), days from first flowering to last flowering on main stem (x_3), days to flower (x_1), nodes on main stem (x_8) and days from first flowering to last flowering on branches (x_4) could explain 90.12% of variability in seed yield (Table 1).

On the otherhand, explainable variability went up to 87.11% by a combination of characters involving pods/plant (x_{12}), days from first flowering to last flowering on main stem (x_3), nodes on primary branches (x_9) and lodging (x_{13}) (Table 2).

Table 2 Stepwise multiple linear regression analysis between yield and different yield contributing characters (for indeterminate varisties)

	R^2	R
$Y=6.318+0.176x_{12}$	0.8080**	0.8988
$Y=24.248+0.191x_{12}-0.719x_3$	0.8316**	0.9119
$Y=32.446+0.138x_{12}-1.062x_3+0.231x_9$	0.8609**	0.9278
$Y=34.317+0.141x_{12}-1.259x_3+0.172x_9+1.519x_{13}$	0.8711**	0.9333

Y = Yield

x_3 = Days from first flowering to last flowering on main stem

x_9 = Nodes on primary branches

x_{12} = Total pods

x_{13} = Lodging

** Significant at 1% level.

In overall analysis combining determinate and semi/indeterminate types of cultivars the pods/plant (x_{12}), days to maturity (x_2), days from first flowering to last flowering on main stem (x_3) and plant height (x_5) could explain for 82.16% of the variability in seed yield (Table 3).

Table 3 Stepwise multiple linear regression analysis between yield and different yield contributing characters (For combined varieties)

	R^2	R
$Y=6.912+0.174x_{12}$	0.7993**	0.8940
$Y=-7.959+0.164x_{12}+0.123x_2$	0.8035**	0.8964
$Y=-18.444+0.161x_{12}+0.253x_2-0.259x_3$	0.8139**	0.9022
$Y=-7.551+0.147x_{12}+0.164x_2-0.384x_3+0.066x_5$	0.8216**	0.9064

Y = yield

x_2 = Days to maturity

x_3 = Days from first flowering to last flowering on main stem

x_5 = Plant height

x_{12} = Total pods

** Significant at 1% level.

Generally these characters have been found to be highly correlated with seed yield i.e. important yield components by various authors (Weber and Moorthy, 1952; Anand and Torrie, 1963; Byth et al., 1969; Wilcox, 1980; Akhands et al., 1981; Dencescu, 1982; Ecochard and Revelomanastosoa, 1982; Bramel et al., 1984; Lin and Nelson, 1988; Ablett et al., 1989).

CONCLUSION

The evaluation of 10 determinate and 10 semi/indeterminate soybean cultivars indicated that variability in yield could be accounted for by total pods/plant alone 72.80%, 80.80% and 79.93%, respectively in determinate, indeterminate and combined cultivars. Total pods/plant, days to maturity, days from first flowering to last flowering on main stem and plant height were the important yield components for soybean cultivars irrespective of growth habit.

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