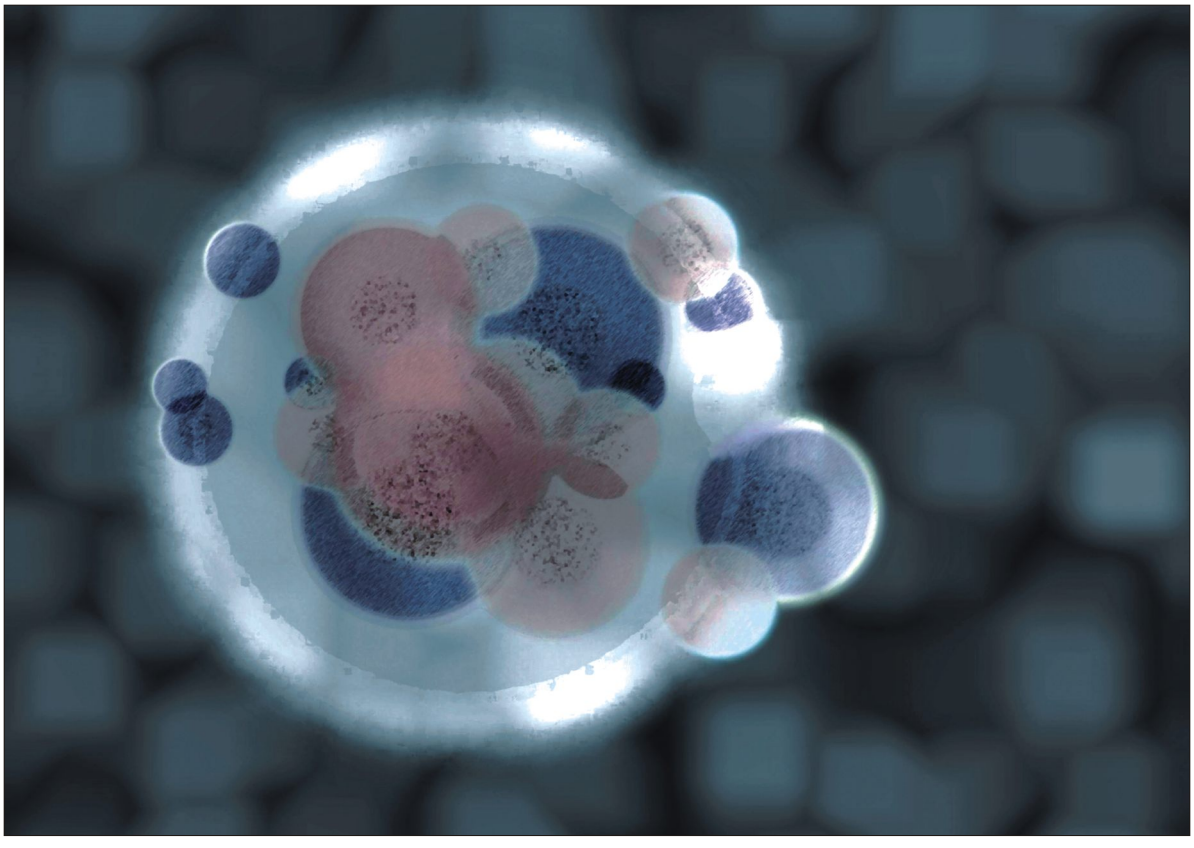

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Performance of Exotic Lentil Varieties under Rainfed Conditions in Mingora (NWFP) Pakistan

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Abstract: Coefficient of variation, in 25 exotic lentil genotypes were very low for maturity (days) (1.16%), flowering (4.36%) and seed yield plant^{-1} (10.22%) but high for pod plant^{-1} (44.03%), seed pod^{-1} (22.84%), biological yield (21.48%) and plant height (cm) (20.75%). Seed yield had significantly positive correlation with pod plant^{-1}, branches plant^{-1}, and seed pod^{-1}. Flowering and maturity revealed weaker but positive correlation with seed yield, while biological yield showed negative correlation with seed yield. Pods plant^{-1} and seed pod^{-1} can be used while selecting lentil varieties for this zone. Plant height also showed very interesting correlation: reducing plant height meant more seeds pod^{-1} and biological yield. However, early maturing, shorter varieties with more number of branches plant^{-1} and seed pod^{-1} may be considered an index for selection in the germplasm under study for yield.

Key words: Lentil, genotypes, correlation, yield, Pakistan

Introduction

Pulses constitute an important ingredient in Pakistani diet, especially in the low income group. Little progress has been made so for in raising their production. Last year the country requirement of pulses was 11,13,900.00 tones, out of which 9,51,400.00 tones (85.41%) were produced locally and the rest of 1,62,500.00 tones (14.59%) (worth 2687.00 million rupees) were imported to meet the country requirement (Ministry of Food Agriculture and Livestock, 2000). With the tremendous increase in population the need for pluses is also increasing, but production increases with very sluggish rate. Concerted efforts are needed to evaluate, introduce better/improved varieties of pulses with high yield potential and disease resistance for autarky in pulses production. Lentil can be a potential crop to narrow down the production-consumption gap. It is an important crop after gram grown in rabbi season both in quality and quantity. Luthra and Sharma conducted experiments on 56 lentil genotypes and reported that pods plant^{-1}, biological yield and seed pod^{-1} were highly significant and positively correlated with seed yield. They also observed significant negative correlation between seeds pod^{-1} and 100 seed weight. Zaman *et al*. (1989) carried out correlation study and concluded that the highest coefficient of variation were revealed for seed yield, pods pod^{-1} and branches plant^{-1}, while the lowest values for C.V. were shown by maturity and seeds pod^{-1}. Furthermore, correlation study showed that seed yield had a highly significant positive correlation with pods plant^{-1}, seeds pod^{-1}, branches plant^{-1} and 50% flowering. The result indicated that profusely branched plants with a high number of pods tends to have a higher yield potential. Ramgiry *et al*. (1989) revealed that grain yield showed a high positive correlation with plant height (Biological yield), branches plant^{-1} and pods plant^{-1}. These characters are always recognized as major contributor to the grain yield. Singh and Singh (1993) evaluated 70 lentil germplasm and reported a wide range of variation for all the characters except for seed pod^{-1}. Variety, Ranjan was earliest to flower, KL-154 exhibited maximum primary branches plant^{-1} (6.8), Precoz had boldest seed (3.8 gm) and maximum seed pod^{-1} (2.0), LL-278 followed by L-4078 were the highest yielding lines among the tested varieties. Rajput and Sarwear (1989) evaluated 22 lentil varieties and reported that plant height ranged from 24.3 to 52.4 cm and that maximum height was attained by a local variety which had a very small grain size (0.70 g/100-seed weight) But with a high number of seed plant^{-1} (216) and produced high grain yield plant^{-1} (7.14 gm). The highest seed yield was recorded in genotype, Precoz x Pant-L-406 and the main yield contributing factors were pod length and number of branches plant^{-1}. Accession FLIP-86-12L had very bold grain 52.4 g/100-seed weight). Bakhsh *et al*. (1991) reported that variety, 78S-26052 took maximum duration (127.67 days) and minimum crop duration by Laird x Precoz-1 with 85.67 days to moderate flowering. Maximum plant height of 71.80 cm was noted for FLIP-84-27L and minimum (42.67 cm) for 74TA-276. Branches plant^{-1} ranged from 7.00-2.27 for ILL-1868 and FLIP-84-62-L, respectively. They further reported that maximum pods plant^{-1} (28.17) was noted for variety ILL-55-86 and minimum of 5.87 was recorded for variety FLIP 84-62L. 1000-seed weight ranged from 48.94 to 20-27. Laird x Precoz-1 produced maximum seed yield plant^{-1} (1.47 gm) followed by FLIP-84-60L (1.30 gm), while Precoz x B-77 remained lowest seed yielder (0.46 gm). Indu and Lal (1987) evaluated 28 bold seeded varieties and concluded that the time to 50% flowering in the tested varieties ranged from 55 days (SL 143) to 69 days in SL-598 and maturity period from 113 to 134 days after sowing in SL-904 and SL-397, respectively. Plant height varied from 28.7 cm (SL-945) to 33.9 cm (SL-598) and 100-seed weight from 2.9 gm (SL-666) to 4.3 gm (SL-143). Although SL-397, SL-597, SL-944 and SL-406 yielded more than the check JSL-1. They were not significantly different from it but were superior in seed size (3.05 gm/100-seed of JSL-1). Mia *et al*. (1986) revealed that time to flowering varied from 53 to 85 days with a mean of 74.7 days in 200 lentil varieties. Similarly time to maturity also ranged from 103 to 140 days, plant height ranged from 34.2 cm to 54.2 cm.
Therefore, this study was carried out to find out most suitable lentil varieties for commercial cultivation in the rainfed areas of Malakand Division in particular and NWFP in general.

Materials and Methods

Twenty five microsperma and macrosperma lentil varieties from four lentil growing countries, obtained from International Center Agriculture Research in the Dry Areas (ICARDA), Syria, were planted at Agriculture Research Station (N) Mingora, under rainfed condition (Table 1). The experiment was laid out in Randomized Complete Block Design (RCBD) with 2 replication. Plot size was 4 x 1.2 m with inter and intra row space of 30 cm, 7 cm, respectively. Fertilizer were applied at 12 kg N, 30 kg P_2O_5 (a bag of DAP) acre^{-1} during soil preparation before sowing. Agronomic practices viz hoeing, weeding, thinning and plant protection measures were

adopted uniformly for all plots to exploit full potential of the varieties. Rainfall during the crop growth and development period (October-May) was 365.2 mm. Observations were recorded on days to flower formation (X1), maturity (X2), plant height (X3), pods plant^{-1} (X4), seed pod^{-1} (X5), branches plant^{-1} (X6), biological yield (X7) and seed yield (X8). The data were statistically analyzed using MSTATC software package. Correlation were calculated by using the "CORRELATION" sub-program of the same package.

Table 1: Origin and number of lentil genotypes

Orgion	Number of genotypes
ICARDA, Syria	18
India	2
Bangladesh	2
Pakistan	3
Total	25

Results and Discussion

Variability observed in twenty five lentil genotypes are given in Table 2. Time to flowering by different genotypes varied from 105.5 to 140.5 days with mean of 126.14 days. Time to physiological maturity ranged from 188.5 to 179.5 days with mean of 183.6 days and revealed very low variability 1.16% coefficient of variation. Similarly, plant height (cm) ranged from 54.13 to 33.50 cm with mean of 20.75 cm. The minimum variability were observed for pod plant^{-1} (44.03) followed by seed pod^{-1} (22.84), biological yield (21.48) and plant height (20.75). The higher variability for pod plant^{-1}, seed pod^{-1} and biological yield might be useful to select higher yielding variety.

Association with yield and yield traits were estimated (Table 2). Flowering had significantly negative association with maturity (-0.212), plant height (-0.445) and branches plant^{-1} (-0.130), but positive association with seeds pod^{-1} (0.163). It meant that early flowering varieties will had tall plants, late maturity and more branches plant^{-1}. Fluctuation in days to flowering has positive association with biological yield, pods plant^{-1} and seed yield.

Maturity had strong association with plant height (0.237), pods plant^{-1} (0.218). Other characters, showed weaker but positive association with maturity. It can be inferred that late maturing varieties had tall plants with maximum numbers of pods plant^{-1}. The results are an agreement with the findings of Mia *et al*. (1986). Plant height showed significant positive association with branches plant^{-1} (0.204) and positive but weak association with pods plant^{-1} (0.074). Plant height revealed significantly negative association with seed pod^{-1} (-0.364) and biological yield (-0.023), while very weak association with seed yield (0.012). The results obtained are in contrast with the findings of Rajput and Sarwar (1989) and Mia *et al*. (1986). Pods plant^{-1} exhibited strong association with seeds pod^{-1} (0.54), branches plant^{-1} (0.435) and seed yield (0.424). Generally negative association has been reported for this character with seed pod^{-1} and branches plant^{-1}. Highly significant positive correlation between seed yield with pod plant^{-1}, seed pod^{-1} and flowering has been reported by Zaman *et al*. (1989) and Luthra and Sharma (1990). Seeds pod^{-1} revealed significantly positive association with branches plant^{-1} (0.323), seed yield (0.259) and biological yield (0.162). It may be due to high correlation of pod plant^{-1} with seed pod^{-1} and branches plant^{-1}. Branches plant^{-1} showed significantly positive association with seed yield, while biological yield revealed strong negative correlation with branches^{-1}. It can be concluded from this study that seed yield had significantly high correlation with pod plant^{-1}, branches plant^{-1}, and seed pod^{-1}. Flowering and maturity revealed weak but positive correlation with seed yield, while biological yield showed negative correlation with seed yield. Furthermore, pods plant^{-1} and seed pod^{-1} can be used while selecting lentil varieties for this zone. Plant height also showed very interesting correlation: reducing plant height meant more seeds pod^{-1} and biological yield. However, early maturing, shorter varieties with more number of branches plant^{-1} and seed pod^{-1} can be an index for selection in the germplasm under study for yield (Table 3).

Table 2: Mean, range and C.V.% of 25 exotic lentil genotypes planted at Agriculture Research Station Mingora, during 1999

Character	Ranges (day)	Mean	CV %
Flower	140.5-105.5	126.14	4.36
Maturity	188.5-179.5	183.60	1.16
Plant height	54.13-33.50	36.56	20.75
Pods plant^{-1}	230.7-65.0	132.68	44.03
Seeds pod^{-1}	2.0-1.0	1.55	22.84
Branches plant^{-1}	6.83-3.665	5.31	14.64
Biological yield	2.05-0.85	1.37	21.48
Seed yield 418.5-105.0	225.34	10.22	

Table 3: Correlation coefficient of yield contributing traits for 25 exotic lentil genotypes at Agriculture Research Station Mingora, during 1999

	X2	X3	X4	X5	X6	X7	X8
X1	-0.212*	-0.445*	0.110	0.163*	-0.130	0.289	0.102
X2		0.237*	0.218*	0.031	0.019	0.073	0.029
X3			0.074	-0.364*	0.204*	-0.023	0.000
X4				0.54**	0.435*	0.022	0.424*
X5					0.323*	0.162*	0.259*
X6						-0.178*	0.355*
X7							-0.57

An astriskes indicate significant at $p<0.05$ (*) and $p<0.01$ (**)

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