Int.J.Curr.Microbiol.App.Sci (2018) Special Issue-7: 3171-3175

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-7 pp. 3171-3175**
Journal homepage: http://www.ijcmas.com

Original Research Article

Association of Seed Yield and Yield Contributing Characters of Lentil (*Lens culinaris* Medik) Grown under Moisture Stress Condition

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A B S T R A C T

In lentil (*Lens culinaris* Medik) seed yield showed significant positive correlation with dry matter/plant, pods weight/plant, number of seeds/pod and per plant, harvest index and biological yield. Seed yield was negatively correlated with 1000 seed weight, but not at significant level. Seed protein content had no significant correlation with any of the lentil characters analysed. It showed highest heritability.

Keywords

Correlation, lentil, yield, yield attributes, protein

Introduction

Pulse crops such as pea, lentil and chickpea are well adapted to water stress conditions. They use less water and can tolerate drought stress better than the cereal crops. Pulse crops use water in a different way than other crops grown in rotation by extracting water from a shallower depth, leaving more water deep in the soil for the following year's cereal or oilseed crop. The water use characteristics of pulse crops effectively increases the water use efficiency of the entire crop rotation. Water stress conditions mostly affects growth of leaves and roots, photosynthesis and dry mater accumulation (Blum, 1996). During reproductive development of lentil crop water stress conditions reduces their yield but limited supplemental irrigation can boost and stabilize its productivity. In rainfed condition, moisture stress affects the plant growth and development in different ways. Some process of growth and development are highly susceptible to increasing moisture stress, while others are for less affected (Shaw and Laing, 1968).

Lentil (*Lens culinaris* Medrik) is an important *rabi* pulse crop grown generally under moisture stress conditions. It is a rich and cheap source of dietry protein for humans in India. The correlation studies on high yield and yield attributes with seed quality are few. Such study will certainly be helpful in identifying suitable high yielding cultivars particularly for rainfed situation. Dhamoliya *et al.*, (2008) evaluated and reported of desi chickpea genotypes in junagarh, Gujrat, that seed yield had significant positive association with pods/plant only while other plant characters

viz. days to 50% flowering, days to 80% maturity, plant height and 100 seed weight were found significantly but negatively correlated with seed yield of chickpea. The present study was, therefore, undertakes to know the genetic architecture of correlation between seed yield and other important yield contributing characters.

Materials and Methods

The present investigation was carried out with 20 genotypes of lentil grown in Randomized Block Design with three replications at crop Research Farm Nawabganj, C.S. Azad University of Agriculture and Technology, Kanpur during *rabi* 2007-08 and 2008-09. Crop was raised under rainfed condition with recommended package of practices. The observations were recorded on dry matter accumulation/plant, number of branches/plant, number of pods/plant, pod weight/plant, number of seeds per pod and per plant, 1000-seed weight, harvest index, biological yield and seed yield. Both type of correlations viz. genotypic and phenotypic were computed.

Results and Discussion

The results regarding variability, heritability and genetic advance are presented in Table 1. Analysis of variance revealed significant differences among all the treatments. Maximum phenotypic and genotypic coefficient variabilities were recorded for number of seeds/plant. The highest heritability was recorded for protein content (97.30 and 95.20) and seeds/plant (93.60) during both years. It might be due to additive gene effect. Genetic advance was recorded highest for biological yield (511.20 and 583.21) and seed yield (262.43 and 247.46) during two years. Protein content had high heritability and low genetic advance while biological and seed yields had low heritability and high genetic advance which revealed that characters may have non-additive gene effect (Table 2). These results are in agreement to those of Bharadwaj and Gupta (2004) who studied on pigeonpea.

The correlation coefficient values (Table 2) revealed that dry matter accumulation/plant had positive and significant association with seeds/pod, seeds/plant, biological yield and seed yield, but had significant negative relation with 1000-seed weight. It indicates that boldness of seed is not desirable under moisture stress condition, while number of seeds played an important role in total biomass and seed production. Singh *et al.,* (2008) also reported that production of high biomass had significant positive correlation with seed yield of rainfed chickpea crop.

Number of pods/plant had significant positive association with pods weight/plant and seeds/plant while significant negative relationship with 1000-seed weight. It might be due to the reason that bold seeded types are poor pod forming. Though pods/plant also had positive correlation with biological and seed yield, but it was not to the level of significance. Pod weight/plant was found positively and significantly correlated with seeds/plant, harvest index and seed yield. Higher pod weight/plant might has increased the ratio of seed in total biomass which may increase the harvest index and seed yield. These results are in accordance those of Singh *et al.,* (1995) in lentil and Sharma *et al.,* (2007) in chickpea. Seeds/pod with seeds/plant had significant positive association with biological and seed yields, but significant negative relationship with 1000-seed weight. It might be due to the reason that bolder seeds in general reduce the number of seeds/pod and plant, but size of seed could not compensate for loss in seed number.

Table.1 Variability, hetitability and genetic advance in 10 characters of lentil

Characters	Grand mean (S.E.)	PCV	GCV	Heritability	Genetic advance
	2007-08				
Dry weight per plant	10.01 (0.77)	11.17	6.02	29.00	0.67
Protein content in seed	24.74 (0.08)	2.53	2.49	97.30	1.25
Number of pods per plant	133.06 (8.37)	18.75	17.09	83.10	42.71
Pods weight per plant	6.23 (0.43)	11.42	7.73	45.80	0.67
Number of seeds per pod	1.61 (0.08)	19.29	18.22	89.20	0.57
Number of seeds per plant	213.78 (12.21)	27.67	26.77	93.60	114.04
1000-seed weight	23.31 (1.11)	15.80	14.69	86.50	6.56
Harvest index	42.85 (1.46)	7.52	6.26	69.20	4.59
Biological yield/ha	2678 (172)	13.78	11.30	67.30	511.20
Seed yield/ha	1150 (94)	16.96	13.71	65.30	262.43
	2008-09				
Dry matter per plant	10.23 (0.31)	8.33	7.43	79.5	1.40
Protein content in seed	24.21 (0.12)	2.72	2.65	95.2	1.32
Number of pods per plant	136.92 (8.18)	18.00	16.44	83.5	42.37
Pods weight per plant	6.41 (0.26)	9.77	8.40	73.8	0.95
Number of seeds per pod	1.86 (0.17)	16.58	12.42	56.1	0.36
Number of seeds per plant	210.42 (9.97)	22.88	22.14	93.6	92.82
1000-seed weight	23.85 (1.01)	15.05	14.13	88.2	6.52
Harvest index	43.33 (0.96)	6.51	5.93	82.8	4.82
Biological yield/ha	2727 (101)	12.07	11.20	86.00	583.21
Seed yield/ha	1183 (96)	16.24	12.84	62.5	247.46

Table.2 Genotypic and phenotypic correlation coefficients for yield, yield attributes and seed quality characters of lentil

Characters	Dry matter per plant	Pods per plant	Pod weight per plant	Seeds per pod	Seeds per plant	1000-seed weight	Seed protein content	Harvest index	Biological yield (kg/ha)	Seed yield (kg/ha)
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Dry mater per plant	**Rg**	-0.029	-0.226	0.954 ***	0.735***	-0.783***	-0.228	-0.244	0.875***	0.653**
	Rp	0.328	0.525*	0.513*	0.507*	-0.105	0.015	0.181	0.861***	0.756***
Pods per plant	0.001	**rg**	0.634**	-0.025	0.698***	-0.731***	0.040	0.108	0.240	0.256
	0.135	**rp**	0.692***	-0.009	0.678**	-0.477*	0.104	0.225	0.413	0.424
Pod weight per plant	0.195	0.695***	**rg**	0.205	0.600**	-0.283	-0.161	0.456*	0.307	0.496*
	0.265	0.543**	**rp**	0.158	0.507*	0.079	0.013	0.516*	0.588**	0.691***
Seeds per pod	0.754***	0.012	0.175	**rg**	0.709***	-0.460*	-0.099	0.285	0.835***	0.825***
	0.739***	0.271	0.147	**rp**	0.682**	-0.381	-0.087	0.273	0.669**	0.647**
Seeds per plant	0.731***	0.574**	0.534*	0.758***	**rg**	-0.846***	-0.005	0.280	0.768***	0.753***
	0.719***	0.552*	0.536*	0.636**	**rp**	-0.697***	0.020	0.247	0.697***	0.684**
1000-seed weight	0.459*	-0.683**	-0.158	-0.754***	-0.767***	**rg**	0.012	0.047	-0.549*	-0.421
	0.275	-0.462*	-0.100	-0.313	-0.654**	**rp**	0.068	0.151	-0.222	-0.114
Seed protein content	-0.226	0.165	0.094	-0.089	-0.131	-0.008	**Rg**	-0.033	-0.005	-0.026
	-0.161	0.185	0.067	-0.001	-0.117	0.027	**Rp**	0.030	0.090	0.073
Harvest index	0.040	0.030	0.335	0.038	0.292	0.031	-0.076	**rg**	0.123	0.607**
	0.214	0.150	0.364	0.246	0.338	0.128	-0.039	**rp**	0.280	0.584**
Biological yield (kg/ha)	0.807***	0.341	0.610**	0.644**	0.804***	-0.497*	-0.045	0.182	**rg**	0.885***
	0.787***	0.425	0.516*	0.684**	0.768***	-0.305	-0.004	0.265	**rp**	0.918***
Seed yield (kg/ha)	0.715***	0.278	0.711***	0.506*	0.834***	-0.448*	-0.093	0.602**	0.916***	**rg**
	0.693***	0.429	0.509*	0.692***	0.709***	-0.124	-0.011	0.610**	0.898***	**rp**

Similar results were reported by Ram and Ali (1983) in case of pea crop. The weight of 1000-seeds had positive but non-significant association with protein content and harvest index and non-significant negative relationship with biological and seed yields. Protein content in seed was not found significantly correlated with any of characters analysed.

The highest positive and significant coefficients of correlation for seed yield were recorded with dry matter/plant, pod weight/plant, number of seeds per pod and per plant, harvest index and biological yield. Hence, the selection for component traits like pod weight/plant, seeds/plant, harvest index and total biomass production are very important for yield improvement in rainfed lentil crop.

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