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Study on the Adaptive Behaviour of Exotic Pea (*Pisum sativum* L.) Varieties under Local Conditions of Peshawar

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Abstract: Ten exotic and one local pea vareities were evaluated for their performance at Agriculture Research Institute, Tarnab, Peshawar. These are Peshawar Local, P-42, P-48, AM-1, Olympia, Elete, S-Zard, Rondo, Climax, Mekardo and Green Sword. Significant differences were found in almost all observation except seeds per pod and first picking-wise yield. Mekardo took maximum days 10.3, 103.67 and 138.7 to first germination, pod formation and first picking respectively as well as got maximum pod length 10.12 cm. Climax showed maximum (89.4%) germination. Earlier flowering, pod formation and picking 43.0, 57.3 and 89.00 days, respectively were recorded in variety Elete. Climax was exhibited late flowering but it got 87.3 days to flowering. Rondo got maximum significant plant height 70.3 cm and maximum pods 178.0 kg^{-1}. Climax produced maximum number of pods per plant (19.3) and minimum number of pods per plant (13.8) were recorded in P-42. Variety Climax out yielded significantly (5290.1 kg ha^{-1}).

Key words: Pea, *Pisum sativum*, cultivars, environmental conditions, yield

Introduction

Pea (*Pisum sativum* L.) a member of the Leguminosae is an important cool season vegetable crop. Minimum germination occurs at soil temperatures, in the 4 to 6 °C range, optimum germination occurs at 16 to 18 °C. High soil temperatures lead to poor emergence. Before bloom, the crop can withstand some frost but the flowers and pods are susceptible to freezing conditions. A regular water supply promotes high yields but excessive rainfall induces root rot.

Pea is self pollinated crop. Seven to ten days are required for the young fruit to become fully elongated. Physiological maturity is reached in 24 to 30 days followed by the transition to the dry seed stage (Marx, 1984).

Well drained clay loam or silt loam with pH range of 6-7.5 is better soil for pea, but it does not tolerate excessive acidity. Well rotted Farm Yard Manure at the rate of 20-25 t ha^{-1} should be added. Baloch (1994) stated that a fertilizer dose of nitrogen 45 kg ha^{-1}, P_2O_5 90 kg ha^{-1} and K_2O 90 kg ha^{-1} produced the best yield of peas. The seed rate for early crop is 100-120 kg ha^{-1}, for late planting 80-90 kg ha^{-1}. Plant to plant distance should be 10-15 row to row distance should be 45 cm. In Pakistan in plain areas peas are grown from October to December, whereas in hilly areas they are planted after mid March. Ten to 15 days irrigation interval is recommended (Baloch, 1994).

The total area under cultivation of dry peas whole in NWFP was 2.2 thousand hectares and in Pakistan 140.3 thousand hectare. The production matter (dry peas whole) of this crop in NWFP was 1.5 thousand tons and in Pakistan 81.8 thousand tons. The yield matter per hectare in kg was 693 in NWFP and 583 in Pakistan in 1996 (Anonymous, 1997-98).

Being a good producing area the growers are unaware of out yielding and best quality cultivars. For this particular reason the present study is designed to make a comparative study of local as well as exotic cultivars of peas under the agro-climatic condition of Peshawar.

Materials and Methods

Study on the adaptive behaviour of exotic pea (*Pisum sativum* L.) varieties under Peshawar local conditions was conducted during the growing season of 2000-2001 at Agricultural Research Institute Tarnab, Peshawar.

The land was thoroughly prepared and divided into subplots. Each subplot was kept 3x1.8 m^2 (5.4 m^2) with plant to plant distance 15 cm and row to row distance 90 cm. There were two rows in each subplot and 20 plants in each row. Different varieties were sown on 31th August, 2000.

The experiment was laid out on a randomized complete block design (RCBD). There were eleven varieties and three replication. Fertilizers were applied at a rate of 25 kg nitrogen, 60 kg P_2O_5 and 30 kg K_2O per hectare. Phosphorus and potash were applied at the time of soil preparation while half of the N was applied at sowing time and half was applied after 45 days of germination. Weeding, hoeing and other practices were carried out uniformly. The varieties selected for the trial are; Peshawar Local, P-42, P-48, AM-1, Olympia, Elete, S-Zard, Rondo, Climax, Mekardo and Green Sword.

The parameters, days to germination, germination percentage, days to flowering, number of days to pod formation, plant height, number of branches/plant, pod length (cm), number of pods/kg, days to first picking and total yield were studied during the trial.

Results and Discussion

Days to germination: Varieties differed significantly as regard days to germination (Table 1). Maximum time (10.33 days) was taken to germination in case of variety Mekardo, while the difference among other varieties for days to germination was non significant and range was from 4 to 6 days. Peshawar Local stood 7th as regards time to germination. Germination mainly depends upon food reserves in the seed, genetic make up, soil condition as soil moisture and temperature.

Germination percentage: Germination of different pea varieties was statistically significant (Table 1). Maximum germination percentage (89.4) was observed in variety Climax followed by Mekardo and AM-I (86.2%), while variety Green Sword showed the lowest germination of 67.6%. The climatic factors might have influenced the new exotic varieties as regards their germination percentage. The difference in germination % age may be due to the difference in genetic make up of different varieties in viability of seed. Local agro climatic conditions may also affect seed germination these results are similar with Qasim and Zubair (1998) who reported that genetic make up and climatic condition affect seed germination.

Days to flowering: The different varieties of pea varied significantly as regards number of days to flowering (Table 1). The maximum number of days (87.33) for flowering were recorded in Climax, followed by Mekardo (85.3 days) while the minimum number of days to flowering (43.00) were observed in Elete. Statistically no difference in days to flowering were recorded in varieties Elete, Olympia, P-42, P-48, Peshawar Local and AM-I. These varieties exhibited least number of days taken to flowering. Peshawar Local, however, a local variety took 46 days to flowering. Long duration result with more vegetative growth a little later flowering and productive growth. This may be due to the variation in genetic make up.

Days to pod formation: Significant differences among pea varieties were found for number of days to pod formation. Maximum

Table 1: Days to germination, germination percentage, days to flowering and number of days to pod formation

Varieties	Days to germination	Germination percentage	Days to flowering	Number of days to pod formation
Peshawar Local	5.3b	81.7dc	46.0bc	062.0cd
P-42	5.0b	83.7c	44.7c	061.3d
P-48	5.0b	72.6g	44.7c	058.3e
AM-1	6.0b	86.2b	45.0c	061.7d
Olympia	5.3b	82.4cd	44.7c	063.0c
Elete	5.7b	80.3e	43.0c	057.3e
S-Zard	4.7b	77.2f	45.7bc	063.0c
Rondo	5.7b	86.1b	45.7bc	063.0c
Climax	6.0b	89.4a	87.3a	101.3b
Mekardo	10.3a	86.2b	85.3a	103.7a
Green Sword	6.0b	67.6h	57.3b	058.3e
LSD value at 5%	1.3	1.6	11.9	1.3

Table 2: Plant height (cm), number of branches/plant and pod length (cm)

Varieties	Plant height (cm)	Branches plant^{-1}	Podlength (cm)
Peshawar Local	58.1bc	3.5b	7.4bc
P-42	55.8bcd	3.2bc	7.6bc
P-48	45.3d	2.8cde	6.9c
AM-1	45.3d	3.1bcd	8.2b
Olympia	58.2bc	4.5a	7.6bc
Elete	54.8bcd	2.6de	8.0b
S-Zard	48.9cd	2.8cde	7.5bc
Rondo	70.8a	2.9cd	7.8bc
Climax	63.7a	3.0cd	8.2b
Mekardo	63.5ab	2.3e	10.1a
Green Sword	52.0cd	3.3bc	7.5bc
LSD value at 5%	10.9	0.5	0.93

Table 3: Pods/kg, days to first picking and total yield

Varieties	Pods kg^{-1}	Days to first picking	Yield ha^{-1} (kg)
Peshawar Local	158.7f	92.7de	2950.6bcde
P-42	163.7e	90.7fg	1944.4e
P-48	169.7cd	90.3fg	1351.8e
AM-1	173.0bc	96.3c	2648.1cde
Olympia	161.3ef	91.7ef	4061.7abcd
Elete	168.7d	89.0g	2185.1e
S-Zard	174.7ab	92.0def	2222.22de
Rondo	178.0a	93.7d	4462.9abc
Climax	170.3cd	136.0b	5290.1a
Mekardo	163.3f	138.7a	4555.5ab
Green Sword	163.7e	90.3fg	1722.22e
LSD value at 5%	3.49	1.69	1843

number of days (103.6) was observed in Mekardo, followed by Climax (101.3), while minimum days to pod formation (57.3) was recorded in variety Elete (Table 1). Variety Climax took more time to flowering but less time to pod formation. This is due to climatic change. This is a clear indication of climatic condition. After germination the days were getting longer and warmer which hasten some varieties and induce flowering but fluctuation in climate during March and April might have influenced flowering and podding process.

Plant height: Significant differences among pea varieties were recorded for plant height (70.8 cm) in Rondo followed by Climax (63.6 cm) (Table 2). Minimum significant plant height (45.3 cm) was observed in P-48. Peshawar Local exhibited 58.1 cm height as compared to exotic varieties (Table 2). It might be due to the response to prevailing environmental condition and the genetic make up. These results are in agreement with Work (1945) and Khokhar *et al.* (1988).

Number of branches per plant: Significant differences were observed among different varieties for number of branches per plant. Maximum number of branches per plant (4.5) were recorded in variety Olympia, followed by 3.5 branches per plant in Peshawar Local, while minimum branches per plant (2.3) were recorded in Mekardo. More time to flowering in some varieties with more number of branches is an indication of more vegetative growth due to climatic conditions. It was observed that some varieties had determinate type growth and their plants bloomed and exhaust simultaneously, hence they have less branches per plant, while other have interminate type of characters producing more branches.

Pod length (cm): Mean value showed significant difference among pea varieties (Table 2). Maximum pod length (10.1 cm) was reported from Mekardo followed by AM-I (8.2 cm) where as minimum length of 6.9 cm was observed in P-48. The results could be the genetic make up of the variety.

Number of pods kg^{-1}: Significant difference was observed in number of pods per kg among various pea varieties (Table 3). Significantly highest number of pods per kg (178.0) were obtained from variety Rondo and minimum pods (158.7 kg^{-1}) in variety Peshawar Local, 161.3, 163.3 and 163.7 pods kg^{-1} in varieties Olympia, Mekardo and Green Sword respectively. The differences among these varieties are non significant. Variety S-Zard recorded yield at par with Rondo. Being a dwarf variety S-Zard was a good yielder. The results might be attributed to the genetic make up of varieties. Variety S-Zard recorded yield at par with Rondo. Being a dwarf variety S-Zard was a good yielder.

Days to Ist picking: Among varieties, significant difference was observed in days taken to first picking. Significantly minimum days (89.0) were taken to first picking by variety Elete and maximum days (138.7) by variety Mekardo. This is due to the changes in behaviour of the different varieties.

Total yield (kg ha^{-1}): Maximum yield of 5292.1 kg ha^{-1} was recorded in variety Climax, whereas Mekardo ranked second with 4555.5 kg ha^{-1}. Varieties P-48, P-42, Elete, S-zard and Green Sword gave minimum yield ranging from 1351.8 to 1722.22 kg ha^{-1}. Peshawar Local recorded 2950.6 kg ha^{-1}. The results could be due to the fact that Climax gave more percent germination (89.44 %). Late maturing varieties like Climax and Mekardo gave more yield as compared to early maturing like P-48, P-42, Elete etc. The results are in line with Nassar *et al.* (1981) who conducted that late maturing varieties are highly productive.

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