

Evaluation of Different Pea (*Pisum sativum* L.) Varieties for High Yield Production Under Agro-climatic Condition of Hazara Division

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Abstract

The performance of six pea varieties were evaluated at Hazara University Dhodihal, Mansehra KPK, and Pakistan in mid of August. The present studies of Six varieties (Climax, Pasan, Rondo, Meteor, Green feast and Sarsabz 980-1) were evaluated for their plant vegetative and reproductive growth (seed germination, days to 50% flowering, plant height, number of branches per plant, number of pods) and physical properties (pod length, pod weight and seed weight) of the peas. The experimental trial was laid out in randomized complete block (RCBD), consisting of 6 treatments (varieties) replicated three times and five selected tagged plants were taken as an experimental unit; the data were collected and analyzed according to standard analytical formula. The results showed the maximum seed germination were found in meteor (90%), the varieties meteor showed that minimum number of days, required to attain 50% flowering, maximum plant height was recorded in climax (92.1cm), maximum number of branches/plant was recorded in meteor (5.4), maximum number of pods was recorded in meteor (14.5), maximum pod weight was recorded in meteor (24.2kg). maximum 100g seed weight was recorded in meteor (19.7g). From research experiments it was concluded that Pea variety Meteor was best showing results for being cultivated in Hazara division.

Keywords: *Pisum sativum*; Yield; Seed

Introduction

Peas (*Pisum sativum* L.) a grain legume, a member of the leguminosae family and native of central or South east Asia, is an excellent human food. It is either eaten as a vegetable or used in the preparation of soups. In addition to that it is also used as animal feed [1] has reported that pea seed is *Pisum sativum* highly

nutritious and approximately half the world production is fed to livestock while the remaining portion is used for human food, primarily in developing counties.

The peas are full of nutrition because its grain is rich in protein (27.8%), complex carbohydrates (42.65%), vitamins, minerals, di-

etary fibers and antioxidant compounds [2]. Among grain legumes Pea ranks 4th in the world on production basis after soybean, groundnut and French beans. Dry pea is produced in more than 87 countries worldwide with approximately one-half the world’s production occurring in Canada, France, China and Russia. Other leading pea producing countries include India, Ukraine, Germany, Australia, United Kingdom and United States. In Pakistan, pea is an important crop, which plays a major role in farmer’s economy. It is the most common crop and enjoys a great commercial demand due to its nutritive value. It is cultivated during winter in plains and during summer in highlands [3]. It represents about 40% of the total trade in pulses.

The area under cultivation of pea crop in Pakistan is 22436 hectares with production of 144422 tonnes. While in KPK pea crop area under cultivation is 1942 hectares with total production 13418 tonnes [4]. In Pakistan it is cultivated under an extensive range of agricultural regions, but the average yield per hectare is very low as compared to its potential and yield obtained in many other countries.

Out of many constrains which limit the pea economical crop growth, the main hindering factor is improper combination of different chemical fertilizers. As compared to many other countries, the average yield of pea crop is very low in Pakistan which may be attributed due to the non-adoption of improved varieties [5] have also reported that variability in old, unimproved varieties needs to be determined in order to create useful genetic variation for broadening the narrow genetic base of commercial cultivars and for making efficient use of available resources.

The other factors like non usage of recommended agronomic practices, application of improper fertilizer doses; diseases and harvesting losses also play an important role in yield reduction. According to [6] the main hurdle in the way of increasing per hectare pea production is the weed competition. Sometimes season long crop-weed competitions reduce the green pod yield by up to 45-55% [7]. In addition to these, environmental factor such as rainfall also affects yield [8] have also reported that seed yield in pea is highly dependent on environment and is particularly responsive to the amount and distribution of precipitation received during the growing season. Keeping all these issues in view, present research work was designed to evaluate the available material for yield other agronomic traits for Hazara division.

Keeping in the view the commercial value of pea plant in Hazara region the present investigation was carried out to find evaluation the high yielding pea varieties under agro climatic condition of Hazara division in order to minimize the economic losses. Performing of different promising pea varieties under agro climatic condition of Hazara division. Effect on yield of pea varieties.

Materials and methods

The present investigation was carried out at experimental farm Hazara University Dhodihal, Mansehra to evaluate the suitable variety for the commercial cultivation of pea in Hazara Division. The experimental plot was laid out in randomized complete block design with three replications. The varieties used were Climax, Passan, Rondo, Meteor, Green feast and Sarsabz 980-1. The seeds were sown on 13th of August, 2019 in a well-prepared bed size of 5 x 3 m². Row to row and plant to plant spacing was maintained at 45 x 20 cm.

All the standard agronomic practices were followed throughout the growing season and recommended a dose of fertilizer was applied for the better nourishment of plants. Farm Yard Manure was applied @ of 1000 kg ha⁻¹ before sowing while DAP @ 250kg ha⁻¹ at the time of sowing. The first irrigation was given immediately after sowing, second irrigation at after a week and subsequent irrigations at an interval of 10 days.

Data collection and data analysis

The data were recorded on randomly selected five tagged plants of each pea varieties. Following observations were recorded during the course of study on % germination, Days to 50% flowering, plant height, number of branches plant-1, number of pods plant-1, pods length, pods weight, and pods yield kg ha⁻¹. The following varieties were evaluated during study.

S. No	Varities
1	Climax
2	Meteor
3	Rondo
4	Sarsab 980-1
5	Green feast
6	Passan

Table 1

The recorded data were subjected to the analysis of variance technique and the significant means were subsequently separated by the lysergic acid diethylamide (LSD) test [9].

Results

In order to explore the adoptability of different pea varieties that may exist in the experimental material, data was recorded on various growth parameters i.e. seed germination percentage, days to 50% flowering, plant height and 100 seed weight respectively. Significant association between these traits has been reported by [10].

Trait	Rep (df=2)	Varieties (df=5)	Error (df=10)	C.V (%)
Seed germination (%)	9.556	275.956**	6.289	3.18
Days to 50% flowering	13.617	357.476**	5.477	3.11
Number of branches per plant	0.51345	2.67032**	0.15722	10.38
Plant height	17.83	1121.84**	8.64	129.81
Number of pods	3.8566	19.5136**	1.1767	10.14
Pod length	4.00056	6.49893**	0.74041	12.04
Pod weight	2.2993	27.5795**	2.2386	7.58
Seed weight	5.8867	13.2667**	0.8293	5.29

Table 2: Mean square values for seed germination percentage (%) days to 50% flowering (DF) number of branches per plant (NBP) plant height (PH) number of pods (NP) pod length (PL) pod weight (PW) and seed weight (SW).

Varieties	SG	DF	NBP	PH	NP	PL	PW kg/plot	100 gm SW
Meteor	92 a	91 a	5.4 a	92.1 a	14.5 a	9.03 a	24.2 a	19.7 a
Green feast	86.6 b	85 b	4.3 b	86.02 b	13.1 a	8.3 a	21.7 ab	19.5 a
Climax	81 c	76.4 C	3.6 bc	77.1 c	9.7 b	8.01 a	19.6 b	17.5 b
Passan	76 d	68.6 d	2.8 d	65.3 d	9.4 b	6.06 b	19.9 b	14.4 c
Sarsabz 98	66.3 f	66.6 de	3.4 cd	45.1 e	8.6 b	5.6 b	16.2 c	15.9 bc
Rando	71.3 e	63.6 e	3.2 cd	49.1 e	8.5 b	5.7 b	16.7 c	16.03 bc
LSD (0.05)	4.5623	4.2577	0.7213	5.3482	1.9735	1.5654	2.7220	1.6568

Table 3: Mean values for seed germination percentage (%) days to 50% flowering (DF) number of branches per plant (NBP) plant height (PH) number of pods (NP) pod length (PL) pod weight (PW) and seed weight (SW).

S. No	Varieties	Yield kg/plot	Yield tonnes/hac
1	Meteor	358.5a	3585
2	Green feast	354.5ab	3545
3	Climax	284b	2840
4	Passan	266.7b	2667
5	Sarsabz 98	248.4c	2484
6	Rando	249.1c	2491
	LSD (0.05)	2.722	

Table 4: Mean Square values for Yield.

Seed germination

Pea variety Meteor stood at par among the seven tested genotypes having maximum germination percentage of 90% followed by pea variety Green feast having 86% germination. Two varieties were fallen in intermediate group and seed germination percentage ranges from 60 to 70%. Passan has 70%, Sarsabz 9800-1

66%, Rondo 71% has 60% germination percentage respectively. Our result coincided with that of [8] have reported that seed germination is affected by physiological age of the seed at harvest and subsequent handling. In addition to this, harvesting time, harvesting, threshing methods and storage conditions also affect the seed viability [11].

Days to flowering

According to the results, days to flowering revealed significant differences (P< 0.05) in table 1. Result showed that minimum Number of days required to attain 50% flowering data revealed significant differences in Meteor (63.6) followed by Green feast (68.6) among the pea varieties. While maximum number of days attained by Rondo (91) followed by Passan (85) respectively. Climax attained (76.4) days to attain 50% days to flowering. Our result matched with that of [12] also reported that pea cultivars have a sufficiently wide range of duration of vegetative period and their consequent phases (flowering, maturation etc.).

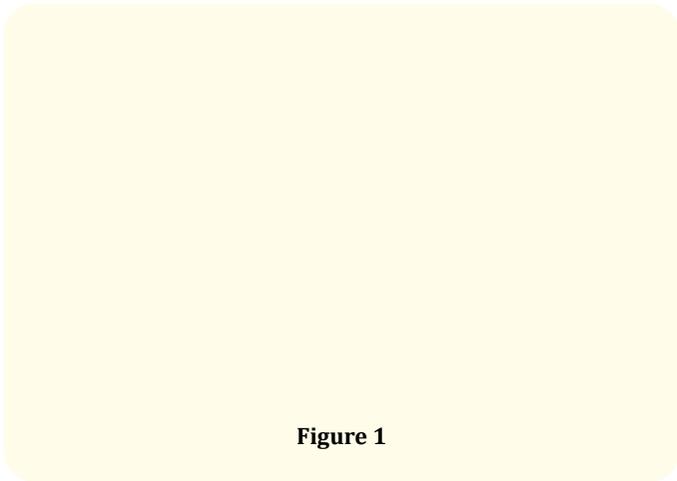


Figure 1

Plant height

In our experiment data for plant height range from 40 cm to 90 cm. According to results in showed that Maximum plant height (92.1) was recorded for pea variety Climax, followed by Green feast, Meteor having (65.3) and (77.1) plants height respectively. Pea variety Passon was having 77.1 cm plant height followed by Rondo having (49.1) while lowest value for this parameter was recorded for local variety Sarsabz (45.1 cm). Pea variety Meteor with medium plant height gave maximum fresh pod yield showing and proving that selection criteria should be based on this. Our result coincided with [13] reported that significant variability existed in Pea genotypes and Plant Height is among those triat having positive and greater influences. Similarly difference in plant height among Pea cultivars were reported by [14].

No of branches/plant

According to results showed that maximum No of branches/plant (5.4) was observed in Meteor followed by Green Feast (4.3) are significantly different from each other. While minimum No of branches were observed in Passon (2.8) pea variety followed by Climax (3.6), Sarsabz (3.4) and Rondo (3.2) respectively. Analyzed data reveals significant difference among all varieties.

Pods plant⁻¹

Maximum green pod/plant was recorded for pea variety Meteor having 14.5 closely followed by Green Feast (13.1) respectively. While Climax and Passon stood 3rd having 9.7 and 9.4 pods/plant and fall in intermediate group. While minimum No of pods was recorded in Rando 8.5 and Sarsabz 8.6 respectively. Our result resem-

bled with [15] has reported that Meteor gave maximum production as compared to Climax in his experiment on pea.

Pods weight (G)

Pod Weight Statistical analysis of the data showed that differences in pod weight of the different varieties were significant. Variety Meteor ranked first maximum pod weight of 24.2kg plot-1, followed by Green feast with 21.75 kg plot-1 stood second. Variety Sarsabz produced the minimum pod weight (16.20 kg plot-1). A higher number of pods plot-1 is attributed to the higher pods weight. These results are in conformation with those of [16,17].

100 Seed weight (g)

According to data, Maximum 100 Seed weight was recorded for pea variety Meteor having 19.7 closely followed by Green feast (19.5) respectively. While Passon and Climax stood 3rd having 19.9 and 19.6 gm seed weight and fall in intermediate group. While minimum No of 100 gm seed weight was recorded in Rando 16.7 and Sarsabz 16.2 respectively. Our result resembled with [15] has reported that Meteor gave maximum production as compared to Climax in his experiment on pea.

Yield

Data revealed that there was significant difference among various pea varieties .The table 2 shows that maximum yield was observed in Meteor (3585 tonnes/hac) followed by Green feast (3545 ton/ha) respectively. While minimum yield production attained by Sarsabz variety (2484 ton/ha) followed by Rondo (2491 tonnes/hac). Variety Climax (2840tons/ha) and Sarsabz (2489 ton/ha) ranked third in yield respectively.

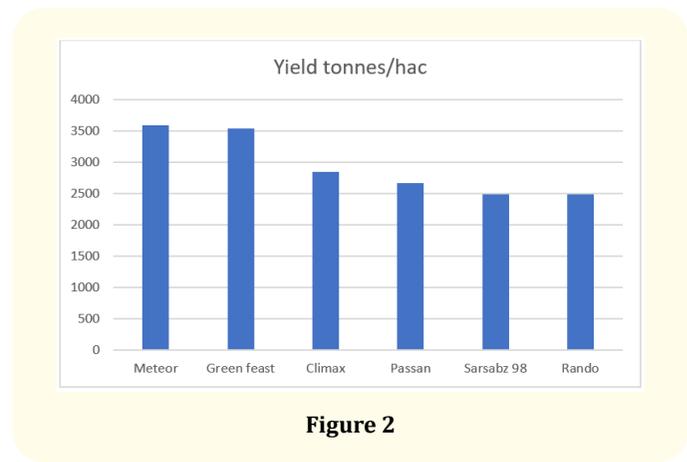


Figure 2

Discussion

The present investigation was carried out at experimental trial at the farm of Hazara University Dhodihal, Mansehra to evaluate the suitable variety for the commercial cultivation of pea in Hazara Division. The experimental plot was laid out in randomized complete block design with three replications. The varieties used were Climax, Passan, Rondo, Meteor, Green feast and Sarsabz 980-1. The seeds were sown on 13th of August, 2019 in a well-prepared bed size of 5 x 3 m². Row to row and plant to plant spacing was maintained at 45 x 20 cm. All the standard agronomic practices were followed throughout the growing season and recommended a dose of fertilizer was applied for the better nourishment of plants. Farm Yard Manure was applied @ of 1000 kg ha⁻¹ before sowing while DAP @ 250kg ha⁻¹ at the time of sowing. The first irrigation was given immediately after sowing, second irrigation at after a week and subsequent irrigations at an interval of 10 days. Pea variety Meteor stood at par among the seven tested genotypes having maximum germination percentage of 90% followed by pea variety Green feast having 86% germination. Two varieties were fallen in intermediate group and seed germination percentage ranges from 60 to 70%. Passon has 70%, Sarsabz 9800-1 66%, Rondo 71% has 60% germination percentage respectively. Days to flowering revealed significant differences (P<0.05). Result showed that minimum Number of days required to attain 50% flowering data revealed significant differences in Meteor (63.6) followed by Green feast (68.6) among the pea varieties. While maximum number of days attained by Rondo (91) followed by Passon (85) respectively. Climax attained (76.4) days to attain 50% days to flowering. Plant height range from 40 cm to 90 cm. Maximum plant height (92.1) was recorded for pea variety Climax, followed by Green feast, Meteor having (65.3) and (77.1) plants height respectively. Pea variety Passon was having 77.1cm plant height followed by Rondo having (49.1) while lowest value for this parameter was recorded for local variety Sarsabz (45.1 cm). Pea variety Meteor with medium plant height gave maximum fresh pod yield showing and proving that selection criteria should be based on this. Maximum No of branches/plant (5.4) was observed in Meteor followed by Green Feast (4.3) are significantly different from each other. While minimum No of branches were observed in Passon (2.8) pea variety followed by Climax (3.6), Sarsabz (3.4) and Rondo (3.2) respectively. Analyzed data reveals significant difference among all varieties. Maximum green pod/plant was recorded

for pea variety Meteor having 14.5 closely followed by Green Feast (13.1) respectively. While Climax and Passon stood 3rd having 9.7 and 9.4 pods/plant and fall in intermediate group. While minimum No of pods was recorded in Rando 8.5 and Sarsabz 8.6 respectively. Variety Meteor ranked first maximum pod weight of 24.2kg plot-1, followed by Green feast with 21.75 kg plot-1 stood second. Variety Sarsabz produced the minimum pod weight (16.20 kg plot-1). A higher number of pods plot-1 is attributed to the higher pods weight. Maximum 100 gm Seed weight was recorded for pea variety Meteor having 19.7 closely followed by Green feast (19.5) respectively. While Passon and Climax stood 3rd having 19.9 and 19.6 gm seed weight and fall in intermediate group. While minimum No of 100 gm seed weight was recorded in Rando 16.7 and Sarsabz 16.2 respectively. Maximum yield was observed in Meteor (3585 tonnes/hac) followed by Green feast (3545 tonnes/hac) respectively. While minimum yield production attained by Sarsabz variety (2484 tonnes/hac) followed by Rondo (2491 tonnes/hac). Variety Climax (2840tons/ha) and Sarsabz (2489 ton/ha) ranked third in yield respectively.

Conclusion and Recommendation

It is concluded from experiment that Meteor Pea variety gave the significant results from germination till harvesting. Under agro climatic condition of hazara division, variety Meteor gave maximum seed germination (92%), days to 50% flowering (63.6%), number of branches per plant (5.4), plant height (65.3), number of pods (14.5), pod length (8.3), pod weight (242) and seed weight (19.7). Maximum yield of Meteor (3585 tons/hac). The variety Meteor being the highest yielder can be recommended to the pea growers of Hazara division for commercial cultivation.

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