Annals of Plant and Soil Research 16(4): 285-288 (2014)

PERFORMANCE OF VARIOUS GENOTYPES OF PEA UNDER FOOTHILL CONDITION OF NAGALAND

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Received: August, 2014; Revised accept: November 2014

ABSTRACT

A field experiment was conducted during Rabi 2012 and 2013 at the Experimental Farm of School of Agricultural Sciences and Rural Development, Medziphema Campus, Nagaland University to evaluate the performance of various genotypes of pea under foothill condition of Nagaland. Seven genotypes of garden pea viz., PEVAR-1, PEVAR-2, PEVAR-3, PEVAR-4, PEVAR-5, AP-3 and VRD-6(C) were evaluated for their growth, yield and quality characters in randomized block design with three replications. Results revealed that all the genotypes exhibited significant variation in their performance in term of growth, yield and quality characters. Among the genotypes, PEVAR-1 recorded maximum plant height (33.28 cm), number of branches plant $^{-1}$ (7.80), number of leaves plant $^{-1}$ (39.07), pod length (6.83cm), pod diameter (2.45 cm), number of pods plant $^{-1}$(9.07), number of seeds pod $^{-1}$(5.60), green pod yield (56.60 q ha^{-1}) and shelling percentage (52.01). Whereas early maturity (53.00 days) was recorded in genotype PEVAR-2. Highest protein content in seed (29.46 %) was recorded in genotype PEVAR-3. It was revealed that genotype PEVAR-1 was found to be the potential yielder, PEVAR-2 with early maturity and PEVAR-3 with better content of protein in seed under existing agro-climatic condition of Nagaland.

Key words: Pea, genotypes, growth, quality, yield

INTRODUCTION

Pea (*Pisum sativum* L.) belonging to the family leguminosae is one of important vegetable crop. In India, pea is grown mainly as a winter vegetable in plains and as a summer vegetable at higher altitudes. Green peas are highly nutritive and rich source of digestible protein (7.2%), carbohydrate (15.77%), minerals and vitamins (Thamburaj and Singh, 2005). Being a rich source of protein, it occupies an important place in vegetarian diet. It is mainly used as fresh pods. Large proportion of pea are canned, frozen or dehydrated for consumption in the off-season. Being a leguminous crop, it also enriches the soil by fixing the atmospheric nitrogen into the soil. Share of pea in total vegetable production is 2.5%. Pea occupies an area of 0.421 million hectares and production of 4.006 million tones with productivity of 9.5 tones/ha (NHB, 2013). Nagaland has a potentiality for the cultivation of pea for fresh vegetable. In Nagaland, the potential of pea as fresh vegetable is not fully exploited, this may be due to the lack of proper knowledge about the genotypes best suited under the prevailing agro climatic condition of Nagaland. Before recommendation of any variety suitable for the region, it is pertinent to evaluate genotypes giving emphasis on the aspects of genotypic suitability and yield. Performance of pea genotypes varies from place to place due to the varied agro-climatic conditions and thus the growth and yield of a genotype does not remain same for all the regions. Considering all the above mentioned facts, a pertinent need was felt to undertake an experiment on performance of various genotypes of pea under foothill condition of Nagaland so as to ascertain and recommend the genotype best suited for the agro-climatic condition of the foothill of Nagaland.

MATERIALS AND METHODS

A field experiment was carried out during *Rabi* season of 2012 and 2013 at the Experimental Farm of SASRD, Medziphema campus, Nagaland University, Nagaland. The experimental site is located at an altitude of 310 m above mean sea level, with geographical location of 25^0 45'43"N latitude and $93^0$33'04"E longitude. The soil of the experimental site was sandy loam having P^H of 4.5, organic carbon 1.54 % and available N, P and K content of 225.79, 16.26 and 208.32 kg ha^{-1}, respectively. The experiment was laid out in randomized block design with three replications. Plot size measured 1.8 m x 1.8 m with a spacing of 45cm x 10cm. Seven genotypes of garden pea *viz*., PEVAR-1, PEVAR-2, PEVAR-3, PEVAR-4, PEVAR-5, AP-3 and VRD-6 (check variety) were evaluated in the experiment. These seven genotypes of pea were obtained from Indian Institute of Vegetable Research, Varanasi, Uttar Pradesh. Seeds were sown in second week of October, both the year. FYM (25 t ha^{-1}) and NPK (30:60:60 kg ha^{-1}) were applied in the experimental plots. N, P and K were given through

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CAN, SSP and MOP respectively. FYM was applied at the time of field preparation 20 days before sowing the crop while full dose of N, P and K were applied two days before sowing the crop. Standard agronomic practices and plant protection measures were adopted as per schedule. Ten plants of each plot were randomly selected and duly tagged for recording the observations. Observations were recorded on plant height, number of branches plant $^{-1}$, number of leaves plant $^{-1}$, pod length, pod diameter, number of pods plant $^{-1}$, number of seeds pod^{-1}, days taken to first flowering , days taken to marketable maturity, pod yield plant $^{-1}$, pod yield ha^{-1} and shelling percentage. The pea genotypes were harvested in first week of December when the pods turn from dark green to light green in color and are well filled with grains. Harvesting was done by hand picking of the pods. The dried sample of green pea seeds under oven were powdered and sieved for determination of nitrogen content. Nitrogen content was determined by Kjeldhal method (Jackson, 1973). Protein content in seeds was determined by multiplied nitrogen content in the seeds with a constant value of 6.25. The statistical analysis was carried out as per procedure given by Panse and Sukhatme (1978). The economics of the various genotypes was calculated on the basis of prevailing market price of different input and output. Gross income was calculated by yield multiplied with whole sale rate of green pea (₹ 3,000 q^{-1}). Net income was estimated by deducting the cost of cultivation from gross income of the particular genotype. Benefit cost ratio was worked out by dividing cost of cultivation from net income.

RESULTS AND DISCUSSION

Growth characters

All the genotypes showed significant variation in regard to plant height at both the stages of crop growth i.e. 30 and 45 days after sowing (Table 1). The genotype PEVAR-1 produced tallest plants (30.05 and 33.28 cm) at both the stages of growth i.e. 30 and 45 days after sowing, respectively which was followed by genotype PEVAR-4. The minimum plant height (14.65 and 16.10 cm) was recorded in genotype VRD-6(C). The number of branches varied significantly in the genotypes and maximum branches (7.20 and 7.80) at 30 and 45 days after sowing, respectively in genotype PEVAR-1 followed by genotype PEVAR-3.

Table 1: Growth characters of various pea genotypes

Genotypes	Plant height (cm)		No. of branches plant^{-1}		No. of leaves plant^{-1}		Days taken to first flowering	Days taken to marketable maturity
	30 DAS	45 DAS	30 DAS	45 DAS	30 DAS	45 DAS		
PEVAR-1	30.05	33.28	7.20	7.80	37.00	39.07	29.00	56.33
PEVAR-2	20.65	22.60	6.07	6.40	27.93	29.40	21.33	53.00
PEVAR-3	16.85	20.10	6.80	7.13	34.47	37.60	30.67	56.33
PEVAR-4	22.72	25.93	6.27	7.07	34.07	36.80	31.00	59.67
PEVAR-5	21.39	23.30	6.13	6.23	29.87	32.40	31.00	59.67
AP-3	21.73	23.40	6.27	6.33	30.27	31.67	39.67	60.67
VRD-6(C)	14.65	16.10	5.20	5.93	22.87	27.00	42.33	63.00
SE(m)±	1.16	1.41	0.28	0.54	1.36	3.52	0.61	0.37
CD at 5 %	3.59	4.34	0.89	1.69	4.19	10.85	1.89	1.14

DAS= days after sowing

The minimum number of branches was recorded in genotype VRD-6(C). Highest number of leaves plant^{-1} was recorded in genotype PEVAR-1 (37.00 and 39.07) at 30 and 45 days after sowing, respectively and minimum in genotype VRD-6(C). The increase in the number of leaves plant^{-1} might be due to the increased number of branches plant^{-1}. Number of days taken to first flowering was significantly affected by genotypes. It was noted that minimum number of days taken to first flowering (21.33 days) was recorded in genotype PEVAR-2 and maximum (42.33 days) in genotype VRD-6(C). The variation in the number of days taken to marketable maturity among the genotypes was significant. Highest number of days taken to marketable maturity (63.00 days) was recorded from the genotype VRD-6(C) and the minimum value (53.00 days) in genotype PEVAR-2. The minimum days taken to marketable maturity by the genotype PEVAR-2 may be due to early flowering exhibited by it that led to early setting of pods and its maturity. The wide variation in growth parameters of all the genotypes might be due to their genetic make-up, which indirectly govern the morphology of the plant. Since all the genotypes were grown under the same climatic condition.

Yield attributes and yield

It is evident from the data (Table 2) that there was significant difference in yield attributing characters among various genotypes. All the genotypes showed significant difference in pod

length. The longest pod length (6.83 cm) was recorded in genotype PEVAR-1 followed by AP-3 having 5.93 cm while the shortest length (4.26 cm) was recorded in genotype VRD-6(C). Pod diameter differed significantly among the genotypes. The maximum diameter of the pod (2.45 cm) was noted in genotype PEVAR-1 and minimum (1.73 cm) in genotype VRD-6(C). Significant differences were observed among the genotypes with respect to the number of pods plant^{-1}. The maximum number of pods (9.07) was recorded in genotype PEVAR-1 which was significantly superior over other genotypes. Minimum number of pods (5.00) was recorded in genotype AP-3. There was a significant difference among the genotypes in terms of number of seeds pod^{-1}. The genotype PEVAR-1 recorded the maximum number of seeds pod^{-1} (5.60) followed by genotype PEVAR-4 (4.93). The minimum number of seeds pod^{-1} was produced in genotype PEVAR-5 (2.27). Number of seeds pod^{-1} has direct effect with the length of pod i.e. longer the pod, the more the number of seeds does it contain. The number of seeds varied due to different pod size. Higher vegetative growth especially more number of branches and leaves plant^{-1} helped in synthesis of greater amount of food material which might have increased yield attributes. Significant differences were recorded among various genotypes with respect to yield and genotype PEVAR-1 produced the highest pod yield plant^{-1}and hectare^{-1} of 29.67 g and 56.60 q respectively closely followed by genotype PEVAR-4 (55.57 q ha^{-1}) while lowest pod yield (43.20 q ha^{-1}) was produced by genotype VRD-6(C). The genotype PEVAR-1 proved significantly superior over other genotypes except genotype PEVAR-4. Number of pods plant^{-1} has a direct affect on pod yield i.e more the number of pods plant^{-1} higher the pod yield plant $^{-1}$. The genotype PEVAR-1, PEVAR-2, PEVAR-3, PEVAR-4, PEVAR-5, and AP-3 produced 31.01, 9.56, 2.38, 28.63, 1.43 and 4.70% higher pod yield over check genotype (VRD-6), respectively.

Table 2: Performance of pea genotypes for yield attributes and yield (mean of two years)

Genotypes	Pod length (cm)	Pod diameter (cm)	No. of pods plant^{-1}	No. of seeds pod^{-1}	Green pod yield plant^{-1} (g)	Green pod yield (q ha^{-1})	Protein content in seed (%)	Shelling (%)
PEVAR-1	6.83	2.45	9.07	5.60	29.67	56.60	25.96	52.01
PEVAR-2	5.61	2.01	7.47	4.07	24.67	47.33	27.42	47.06
PEVAR-3	5.16	2.04	6.40	4.13	23.33	44.23	29.46	46.26
PEVAR-4	5.43	2.04	5.80	4.93	28.67	55.57	29.17	46.23
PEVAR-5	5.69	2.20	5.40	2.27	22.28	43.82	24.50	47.96
AP-3	5.93	2.09	5.00	3.47	23.83	45.27	23.92	45.98
VRD-6(C)	4.26	1.73	5.67	3.00	22.00	43.20	20.13	42.79
SE(m)±	0.23	0.07	0.34	0.29	1.25	2.27	1.77	0.71
CD at 5 %	0.71	0.23	1.07	0.91	3.85	6.99	5.47	2.21

Quality parameters

Data (Table 2) revealed that all the genotypes showed significant difference for protein content in seed and shelling percentage. The maximum protein content (29.46 %) was recorded in the seeds of genotype PEVAR-3 closely followed by genotype PEVAR-4 (29.17 %). Genotype VRD-6(C) recorded the minimum content of protein (20.13 %). PEVAR-3, PEVAR-1, PEVAR-2, PEVAR-4 and PEVAR-5 genotypes were at par with regard to protein content in seed. Differences in protein content of seed might be due to the genetic constitution of the genotypes. The maximum shelling percentage (52.01) was recorded from the genotype PEVAR-1 followed by PEVAR-5 (47.96). The minimum shelling percentage (42.79) was recorded from the genotype VRD-6(C). The genotype PEVAR-1 was found significantly superior over other genotypes in respect of shelling percentage.

Economics

It is evident from Table 3 that highest net income (`.1,17,800) with benefit cost ratio (2.26) was recorded in genotype PEVAR-1 followed by genotype PEVAR-4 which recorded net income (`.1,14,710) with benefit cost ratio (2.20). The reason of highest net income in genotype PEVAR-1 might be due to maximum yield produced in genotype PEVAR-1. From the results, it may be concluded that genotype PEVAR-1 was found to be the potential yielder in regard to pod yield of pea and PEVAR-4 was rated second best genotype under existing agro-climatic condition of Nagaland. PEVAR-3 proved in respect of protein content. That genotype PEVAR-1 also recorded highest net income (`.1,17, 800 ha-^{1}) with benefit cost ratio (2.26). Therefore, PEVAR-1 and PEVAR-4 are recommended for commercial cultivation of pea under foothill condition of Nagaland.

Table 3: Economics of various pea genotypes

Genotypes	Cost of cultivation (₹ ha^{-1})	Green pod yield (q ha^{-1})	Gross income (₹ ha^{-1})	Net income (₹ ha^{-1})	Benefit cost ratio
PEVAR-1	52000	56.60	169000	117800	2.26
PEVAR-2	52000	47.33	141990	89990	1.73
PEVAR-3	52000	44.23	132690	80690	1.55
PEVAR-4	52000	55.57	166710	114710	2.20
PEVAR-5	52000	43.82	131460	79460	1.52
AP-3	52000	45.27	135810	83810	1.61
VRD-6(C)	52000	43.20	129600	77600	1.49

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