Int. J. Agriworld, Vol. 2[1] January- 2021
©2020 SVPSS, India
Online ISSN: 2582-7537
Journal's URL:http://www.svpss.in
Received 15.12.2020 Revised 28.12.2020 Accepted 08.01.2021
ORIGINAL ARTICLE **OPEN ACCESS**

Effect of different crop geometry on the growth and yield of Pea (*Pisum sativum*) under Teak (*Tectona grandis*) based Agroforestry system

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Abstract

The field experimental study was conducted at Forest Nursery & Research Farm, College of Forestry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P) India, to study the Effect of different crop geometry on the growth and yield of Pea (*Pisum sativum*) under Teak (*Tectona grandis*) based agroforestry system. The experiment was laid out in RBD (factorial) with nine treatments and three replications in open area as a sole crop and under Teak. The treatments comprised 3 levels of spacing (15×20, 20×25, and 25×30 cm). Results indicate that S_3 (25×30 cm) gave significantly maximum germination percentage (95.086) in open and (93.943) under Teak, plant height (61.53 cm) in open area and (60.00 cm) under teak, No. of leaves (73.426) in open area and (72.533) under Teak, No. of pods/plant (9.956) in open area and (9.500) under Teak, Test weight (520.056) in open area and (518.163) under Teak, and Total green pea yield (79.006q/ha) in open area and (78.410) under Teak based Agroforestry system.

Keywords: Spacing, Pea, Teak, Crop geometry, Plant height, No. of pods, Yield etc.

INTRODUCTION

Agroforestry system with judicious mixing of crop and trees meet all basic requirements of mankind and ecosystem (Ranjan *et al*, 2016). Growing of perennial crops is one of the strategies to improve soil conditions which would result in enhancing soil attributes and contributing to the good health of the soil. These positive effects are often attributed to the component of the system. Before discussing evidence to support or discredit these concepts it is pertinent to define what is meant by the terms agroforestry and low this relates to the impact of trees on soils (Kumar *et al.*, 2015).

Pea is an annual herbaceous plant of leguminosae family. Plants, being erect in case of garden pea, remain erect while in case of field pea they have a tendency to climb when provided with a support. Plants bear tap root system with nodules on the surface. Stems are hollow, slender, succulent and ridged. It bears pinnately compound leaves with three pairs of leaf- lets and terminal one is modified into a branched tendril. The flowers are arranged in the form of an auxiliary raceme. The seeds may be round. A Based on genetic diversity, four centers of origins, namely, Central Asia, the Near East, Abyssinia and the Mediterranean have been recognized (Gritton, 1980). Non-pigmented peas to be used as a vegetable were grown in United Kingdom in the middle Ages (Davies *et al*., 1985). Pea was introduced into the Americas soon after Columbus and a winter type pea was introduced from Austria in 1922. Peas are cultivated for the fresh green seeds, tender green pods, dried seeds and foliage (Duke, 1981). Green peas are eaten cooked as a vegetable, and are marketed fresh, canned, or frozen while ripe dried peas are used whole, split, or made into flour (Davies *et al*., 1985). Green foliage of garden pea is also used as vegetable in parts of Asia and Africa. Leaves are used as a pot herb in Burma and parts of Africa" (Kay, 1979). Some cultivars are grown for their tender green pods, which are eaten cooked or raw. "Oil from ripened seed has antisex hormonic effects; produces sterility and

antagonizes effect of male hormone" (Duke, 1981). "Based on protein digestibility of peas in broilers, it is reported that the natural protein of peas and faba bean is almost entirely digested in the small intestine and the impaired performance in literature was attributed to an increased secretion of endogenous protein" (Huisman and Van der Poil, 1994).

Teak is one of the valuable species which can be successfully cultivated in agroforestry system. It is considered as king of timber species. It is a deciduous tree, grows straight, and has cylindrical bole, sparse canopy and deep root system which together make it more suitable for agroforestry system. Its durability, strength properties, workability, polishing qualities and versatile utility offer a distinctive position in world-wide timber trade.

MATERIALS AND METHODS

The experiment was conducted during the *Rabi* season at the Research farm and Forest nursery, College of Forestry, SHUATS, Prayagraj. The soil had pH of 7.6, available soil N, P_2O_5 and K_2O 237, 19.60 and 95 kg ha^{-1} respectively. The experiment was laid out in RBD (factorial) with three levels of crop geometry comprising of nine treatment combinations each replicated thrice. Treatments were randomly arranged in each replication, divided into twenty seven plots. The treatments comprised 3 levels of crop geometry (15×20, 20×25, and 25×30 cm). Vasundhara-11 variety was selected for sowing and crop was shown on 15th October. The recommended dose of 80:70:60 kg N: P: K per ha was applied according to the treatment details. Nitrogen was applied in two split doses 1/2 nitrogen, whole of phosphorus and potash at the time of sowing and remaining 1/2 nitrogen at 30 days after sowing.

RESULTS AND DISCUSSION

Crop geometry significantly influenced the plant height, no. of leaves, no. of pods/plant; test weight and pea yield (Table1 and table2). Crop geometry 25 × 30 cm was recorded significantly maximum germination percentage (95.086) in open and (93.943) under Teak, plant height (61.53 cm) in open area and (60.00 cm) under teak, No. of leaves (73.426) in open area and (72.533) under Teak, No. of pods/plant (9.956) in open area and (9.500) under Teak, Test weight (520.056) in open area and (518.163) under Teak, and Total green pea yield (79.006q/ha) in open area and (78.410) under Teak based Agroforestry system. Whereas, crop geometry 15×20 was recorded significantly least germination percentage, plant height, no. of leaves, no. of pods/plant, test weight and pea yield in respect to growth and yield parameters as compared to crop geometry 20×25, and 25×30 cm.

Table 1: Effect of different crop geometry and their interaction on growth and yield attributes of Pea in open area as a sole crop.

Treatment	Germination Percentage	Plant height (cm)	No. of leaves Plant^{-1}	No. of pods plant^{-1}	Test weight (1000 seeds)	Green Pea yield (q ha^{-1})
T_1	92.443	58.700	72.066	9.333	518.933	78.390
T_2	90.610	56.833	71.333	8.800	517.900	77.850
T_3	92.416	55.100	71.800	8.870	517.493	78.033
T_4	95.086	61.533	73.426	9.956	520.056	79.006
T_5	92.120	55.466	72.033	8.280	517.733	78.260
T_6	86.333	53.410	68.333	7.433	516.346	73.310
T_7	91.000	56.433	71.600	8.066	518.180	76.640
T_8	91.093	55.100	72.000	8.466	518.210	76.073
T_9	86.120	56.800	71.000	8.000	516.120	76.080

F-test	NS	S	S	S	S	S
CD at 5%	1.912	2.590	0.964	3.104	1.121	1.164
Interaction	0.774	1.140	2.166	1.114	0.544	0.541

Table 2: Effect of different crop geometry and their interaction on growth and yield attributes of Pea under teak based Agroforestry system

Treatment	Germination Percentage	Plant height (cm)	No. of leaves Plant^{-1}	No. of pods plant^{-1}	Test weight (1000 seeds)	Green Pea yield (q ha^{-1})
T_1	91.223	57.666	71.200	9.096	517.773	78.126
T_2	90.640	55.966	70.053	8.433	517.316	77.706
T_3	91.000	52.490	70.033	8.243	517.303	77.700
T_4	93.943	60.000	72.533	9.500	518.163	78.410
T_5	87.036	53.466	70.100	7.800	517.543	77.670
T_6	85.000	49.700	68.133	6.766	514.130	72.133
T_7	85.000	53.900	70.566	7.900	517.723	75.740
T_8	87.166	54.100	71.100	8.230	517.673	75.676
T_9	84.122	50.000	69.073	7.800	515.160	74.182
F-test	NS	S	S	**S**	S	S
CD at 5%	2.166	3.116	1.052	0.717	1.958	1.224
Interaction	0.854	1.510	0.441	0.334	0.654	0.541

The probable reason for significant increase in yield component observed with successive increase in plant population up to 25 × 30 cm crop geometry and decrease in crop growth rate with decrease in plant population. The results are in confirmation with the results reported by Gozubenli *et al.* (2003) and Sahoo *et al.* (2007).

CONCLUSION

It was concluded from the study that crop geometry 25 × 30 cm significantly increased the germination percentage (95.086) in open and (93.943) under Teak, plant height (61.53 cm) in open area and (60.00 cm) under teak, No. of leaves (73.426) in open area and (72.533) under Teak, No. of pods/plant (9.956) in open area and (9.500) under Teak, Test weight (520.056) in open area and (518.163) under Teak, and Total green pea yield (79.006q/ha) in open area and (78.410) under Teak based Agroforestry system.

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CITATION OF THIS ARTICLE

Kumar, Anil, Mehera, B. and AgarwalYogesh Kumar (2021). Effect of different crop geometry on the growth and yield of Pea *(Pisum sativum) under Teak (Tectona grandis)* based Agroforestry system, *Int. J. Agriworld*, Vol. 2 [1] : 24-27.