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EFFECT OF PLANT DENSITY ON MARKETABLE LEAF PRODUCTION OF MAGAHI PAN

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Abstract

The present experiment was conducted for comparing three plant population density (1.50, 1.75 & 2.0 Lakh Vine ha^{-1}) with the farmer practices (1.25 Lakh vine ha^{-1}) during 2012-13 at Betelvine Research Centre, Islampur, Nalanda (Bihar), India. The plant population density of 1.50 Lakh Vine ha^{-1}) exhibited higher no. of branches (16.01 Vine^{-1}), maximum vine elongation (11.1 cm month^{-1}) and more fresh weight of leaves (231.68 g 100 leaves^{-1}). Though higher marketable leaves per hectare with plant population of 1.75 and 2.0 Lakh vine ha^{-1} were obtained but fresh weight was reduced as a result of reduction in leaf size. However, plant density of 1.5 Lakh Vine ha^{-1}) resulted significant marketable yield of leaf (24.86 Lakh ha^{-1}) due to ideal fresh weight (231.68 g/100 leaves) and lower incidence of *Phytophthora foot rot*disease (8.6%) in comparison to higher plant density treatment (1.75 and 2.0 lakh Vine ha^{-1}.

Key words : Plant density, Magahi pan, leaf production.

Introduction

Magahi Pan (*Piper betle* L.) is first GI registered variety of betelvine in India specially grown in the Magadh region of Bihar for its leaves as economic part, so named Magahi pan (Das *et al.*, 2018). Due to its region specific quality like non-fibrous and softest natureof leaf, it was registered under GI act by Government of India (Anonymous, 2017). It is cultivated around 439 haland out of 4000 ha area of betelvine in Bihar (Jha and Kumar, 2014). Production of betel leaf was declining in this areabecause; farmers were not maintaining optimum plant density of Magahi Pan.Plant density significantly influences the productivity per unit area by decreasing or increasing the availability of total assimilates to leaf of betelvine. Determination of the optimal plant population density necessary for optimal yield is a major agronomic goal. Efficient interception of radiant energy incident to the crop surface of betelvine leads to uniform distribution to give complete ground cover. This can be achievable only by manipulating the stand density and its distribution over the land. Therefore, a study was conducted in order to identify optimumplant density optionfor enhancing marketable leaf production of Magahi Pan.

Materials and Methods

The present experiment was conducted for comparing three plant population density (1.50, 1.75 & 2.0 Lakh Vine ha^{-1}) with the farmer practices (1.25 Lakh vine ha^{-1}) during 2012-13 at Betelvine Research Centre, Islampur (BAU, Sabour) under All Iindia Coordinated Research Project on MAP and Betel vine with three replications in randomized block design. A common dose of N, P_2O_5 and K_2O @ 200: 100: 100 kg ha^{-1}) were applied in all the treatments. The experimental site fall under Agro-climatic Zone IIIB of Bihar and situated approximately at 25°07' N Latitude and 85°24' E Longitude with an altitude of 60.0 meter above mean sea level. Stem cuttings about 30-45cm long with 3-5 nodes are used for propagation and the planting was done during the month of May-June.

Results and Discussion

Number of branches and vine elongationof Magahi Pan

All the plant density treatments had a significant effect on number of branches per vine in Magahi Pan (table 1) however, a decreasing trend in number of branches was

Table 1 : Effect of Plant density on marketable leafproduction of Magahi Pan.

Treatments	**No. of marketable leaf (Lakh/ha)**	**No. of branches/ vine**	**Vine elongation/ Month (cm)**	**Fresh weight of 100 leaves (g)**	***Phytophthora foot rot* incidence (%)**
T_1- Control as farmer practices (Plant population @1.25 Lakh Vine/ha)	20.45	13.44	8.05	168.21	13.86
T_2- Plant population @1.50 Lakh Vine/ha	24.86	16.01	11.10	231.68	8.68
T_3- Plant population @1.75 Lakh Vine/ha	25.42	14.56	10.32	230.40	11.45
T_4- Plant population @2.00 Lakh Vine/ha	27.25	12.88	9.43	229.16	17.52
SEm±	0.84	0.48	0.41	7.70	0.30
C.D. (P=0.05)	2.73	1.55	1.33	24.99	0.99

observed with increasing plant population density from 1.50 to 2.00 Lakh Vine ha^{-1}. Among the different treatments, plant population of 1.50 Lakh Vine ha^{-1} exhibited maximum number of branches (16.01 vine^{-1}), which was significantly more than highest plant population density (2.00 Lakh vine ha^{-1}) and farmers practices (1.25 Lakh vine ha^{-1}). The minimum number branches (12.88 vine^{-1}) was found inhighest plant population density (2.00 Lakh Vine/ha.). However, the difference in number of branches between highest plant population density and control plot treatmentwere not marked. The different treatments showed almost similar influence on vine elongation month^{-1}. However, the maximum values forvine elongation (11.10 cm month^{-1}) was recorded with the plant density of 1.50 Lakh Vine ha^{-1} (table 1). This was statistically at par with the plant density of 1.75 Lakh Vine ha^{-1} but significantly superior than farmer practices (1.25 Lakh vine ha^{-1}) and highest planting density treatment (2.00 Lakh vine ha^{-1}). The number of branches and vine elongation of Magahi Pan also exhibited a increasing trend with the decreasing plant density from 2.00 to 1.50 Lakh Vine ha^{-1}. This might be owing to competition-free healthy and robust vine growth at lower planting density from 1.50 to 2.00 Lakh Vine ha^{-1} except plant density of1.25 Lakh Vine ha^{-1} (control plot). The results are in close conformity with the finding of by Dwevedi *et al*. (2008). They have reported highest increment of vine elongation month^{-1} in Bangla Pan at the planting density 1.50 Lakh Vine ha^{-1} at RAU, Pusa (Samastipur), Bihar, India.

Fresh weight ofleavesof Magahi Pan

The different plant population density in betelvine crop had marked influence on fresh weight of 100 leaves during (table 1) over farmer practices. The plots having plant density of 1.50 Lakh Vine ha^{-1} had significantly higher fresh weight of leaves (231.68 g 100 leaves^{-1}) than farmer practices (1.25 Lakh vine ha^{-1}), but at par to the plant population density of 1.75 and 2.00 Lakh Vine ha^{-1} The farmer practices attained the lower values of fresh weight (168.21 g 100 leaves^{-1}). However, the fresh weight of 100 leaves remained statistically at par among the plant density 1.50, 1.75 and 2.0 Lakh Vine ha^{-1} but decreasing trend was observed with increasing plant density excluding farmer's practices. This might be due to more competition between vines of Magahi pan for place, nutrient and light when grown at higher plant density rate in the betelvine conservatory (Baroj). Similar results was observed by Dwevedi *et al*. (2008)

Leaf yield of Magahi Pan

Data presented in table 1 showed that the yield of Magahi pan (number of marketable leaves) was highly affected by planting density. The leaf yield of Magahi pan exhibited increasing trend with increasing plant density but the differences in marketable leaves among the plant density of 1.50, 1.75 and 2.0 Lakh Vine ha^{-1} were not significant. However, these treatments showed their superiority over farmers practices (1.25 Lakh vine ha^{-1}) in terms of leaf yield. The maximum leaf yield (27.25 Lakh leaves ha^{-1}) was recorded with the highest planting density plot (2.0 Lakh Vine ha^{-1}), but there was decreasing trend in fresh leaf weight was observed due to reduction in the size leaf size at higher plant density which fetch lower market price. Overall the leaf yield obtained from plant density (1.50 Lakh Vine ha^{-1}) resulted significant number of marketable leaves (24.86 Lakh leaves ha^{-1}) with lower incidence of *Phytophthora foot rot* disease (8.68%) in comparison to higher plant density treatments (1.75 & 2.0 lakh Vine/ha). Due to larger leaf size at plant density 1.50 Lakh Vine ha^{-1} resulted highest fresh weight of leaves and consequently get more economic returns by selling the leaves in the market. The number marketable leaves was minimum (20.45lakh leaves ha^{-1}) in control plot (1.25 Lakh vine ha^{-1}). The significant marketable leaf yield may be due to uniform crop establishment at plant density 1.50 Lakh Vine ha^{-1} in the field which leads to vigorous vine growth and less mortality rate as a result of minimum incidence of *Phytophthora foot rot* disease and higher yield-attributing characters like number of branches $vine^{-1}$and vine elongation $month^{-1}$ as well as fresh weight of leaves**.** This finding confirmed with the result of Dwevedi *et al*. (2008).

Disease incidence inMagahi Pan

It is revealed from the experimental data (table 1) that the percent disease incidence of *Phytophthora foot rot* was minimum (8.68%) at plant density 1.50 Lakh Vine $ha^{-1}$and increased appreciably with higher plant density treatments (1.75 and 2.0 lakh Vine ha^{-1}) and farmer practices (1.25 Lakh vine ha^{-1}). The plant density treatment at 2.0 lakh Vine ha^{-1} exhibited maximum disease incidence of *Phytophthora foot rot* (17.52%) due to which number of marketable leaf was reduces at this planting density. The result was in close agreement with the findings of Dwevedi *et al*. (2008).

Conclusion

Based on the result of one year experimental trial, it may be concluded that the plant density of 1.5 Lakh Vine/hawas suitable for higher marketable leaf production of Magahi panin agro-climatic zone III B of Bihar.

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