Effect of growth promoters and fertilizers on growth performance of patchouli in the nursery

APURVA V TUPASOUNDARYA, NA MESHRAM*, SS DESAI, AS GAWALI and SS NARKHEDE

AICRP on Agroforestry, College of Forestry
Dr Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli 415712 Maharashtra, India
*Email for correspondence: nandkishor.meshram@rediffmail.com

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ABSTRACT

An experiment was conducted during 2021-2022 at the research farm of AICRP on Agroforestry, Dr Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra to study the effect of growth promoters and fertilizers on growth performance of patchouli under nursery. The results indicated that the application of treatment of Konkan Annapurna briquettes (KAB) 4 + indole butyric acid (IBA) 1,500 ppm + gibberellic acid (GA) 1,500 ppm + *Azotobacter* 4 g per plant was significantly superior and resulted in maximum collar diameter (6.67 mm), number of leaves per plant (72.33), plant height (63.33 cm) and number of branches per plant (5.93) at 45 DAS as compared to all other treatments. The treatment also resulted in maximum leaf area (3,012.50 mm^2) and survival percentage along with some other treatments. Hence, this treatment could be used to get better crop of patchouli in the nursery.

Keywords: Patchouli; KAB; IBA; GA; *Azotobacter*

INTRODUCTION

Patchouli (*Pogostemon cablin* Benth) is an industrially valued aromatic medicinal plant currently having a huge demand for its essential oil. It is widely used in flavour and fragrance industries as well as in pharmaceuticals (Swamy and Sinniah 2016). At present, the global requirement of patchouli oil is met mainly through production from Indonesia. However, due to adverse conditions in Indonesia, the supply of oil is irregular. India's available infrastructure and environment can provide an opportunity to gain a major part of the world market.

Indian demand for patchouli oil is around 220 tonnes valued at 33 crores, while global demand is to the tune of 1,600 tonnes of oil per annum with a value of 240 crores (Vijaykumar 2004). Most of it presently comes from Indonesia. Commercial cultivation of the crop in India was first attempted by Tata Oil Mills in 1942. After initial stray attempt to grow the crop, its systematic cultivation started in 1962 by Central Institute of Medicinal and Aromatic Plants (Gogoi 2009).

Patchouli is a partial shade loving plant and most of the farmers are cultivating it in India under agroforestry-based system (Ruke et al 2023). Farmers are also growing it in open field conditions on large scale. The present study was conducted to see the effect of growth promoters and fertilizers on growth performance of patchouli in the nursery.

MATERIAL AND METHODS

The experiment was conducted during 2021-2022 at the research farm of AICRP on Agroforestry, Dr Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli, Maharashtra in completely randomized design with eight treatments viz T_1: Konkan Annapurna briquettes (KAB) 4 per plant, T_2: KAB 4 + indole butyric acid (IBA) 1,500 ppm per plant, T_3: KAB 4 + gibberellic acid (GA) 1,500 ppm per plant, T_4: KAB 4 + *Azotobacter* 4 g per plant, T_5: KAB 4 + IBA 1,500 ppm + *Azotobacter* 4 g per plant, T_6: KAB 4 + GA 1,500 ppm + *Azotobacter* 4 g per plant, T_7: KAB 4 + IBA 1,500 ppm + GA 1,500 ppm + *Azotobacter* 4 g per plant and T_8: Absolute control, replicated thrice. Sixty-day old patchouli sapling shoots were planted in standard media-filled

polythethene bags under nursery conditions. The recommended fertilizer dose of 4 Konkan Annapurna briquettes (KAB) per plant (136:56:24 kg N:P_2O_5:K_2O/ha) was used in the experiment. Height, leaf area, survival percentage, collar diameter, number of branches and all the observations were recorded as per the standard procedures. The obtained results were statistically analyzed and appropriately intercepted as per Panse and Sukhatme (1985).

RESULTS and DISCUSSION

Balanced application of growth promoters, biofertilizer and nutrients significantly improved the growth of patchouli crop under nursery condition (Table 1).

After 45 days of sowing, significantly maximum collar diameter (6.67 mm) was observed in the treatment T_7 (KAB 4 + IBA 1,500 ppm + GA 1,500 ppm + *Azotobacter* 4 g/plant) followed by T_6 (KAB 4 + GA 1,500 ppm + *Azotobacter* 4 g/plant) (5.90 mm) and minimum in T_8 (Absolute control) (3.15 mm) and T_1 (KAB 4/plant) (3.46 mm), the latter two being at par. Maximum number of leaves per plant was also observed in T_7 (72.33) and minimum in T_8 (30.31). Maximum leaf area of 3,012.50 and 2,937.56 mm^2 was observed in T_7 and T_6 respectively, which were statistically at par and minimum in T_8 (2,234.76 mm^2). Similarly, maximum plant height of 63.33 was observed in T_7 followed by and T_6 (59.66 cm) and minimum in T_8 (30.50 cm). Maximum number of branches per plant was observed in T_7 (5.93) followed by T_6 (5.33) and minimum of 3.46, 3.67 and 3.66 in T_1, T_2 (KAB 4 + IBA 1,500 ppm/plant) and T_8 respectively, which were at par. Highest survival of plants was observed in T_7 (97.67%), T_5 (KAB 4 + IBA 1,500 ppm + *Azotobacter* 4 g/plant) (96.00%), T_6 (96.00%) and T_4 (KAB 4 + *Azotobacter* 4 g/plant) (95.67%), all being at par and lowest in T_8 (91.00%) and T_1 (93.00%), the two being at par.

The minimum growth in control treatment could be due to unbalanced use of nutrient sources (Ruke et al 2023). The growth promoters enhance the growth of plants by increasing the enzyme and metabolic activities in the plants. The application of biofertilizers and inorganic fertilizers in soil help to increase the microbial activity and nutrient availability in soil ultimately increasing the growth of plants (Mali et al 2023a, 2023b).

Ruke et al (2023) recorded maximum plant height of patchouli in the treatment comprising IBA 1,500 ppm + GA_3 1,500 ppm + *Azotobacter* 15 kg/ha. Gul et al (2006) reported increase in the number of nodes, branches, number of green leaves and essential oil yield of shade-grown patchouli by the foliar application of GA_3. The pinching + BA 300 ppm recorded significantly higher number of branches, number of leaves and higher plant spread in patchouli (Asangi and Vasundhara 2013).

Table 1. Effect of growth promoters and fertilizers on plant growth parameters and survival of patchouli at 45 DAS

Treatment	Collar diameter (mm)	Number of leaves/plant	Leaf area (mm^2)	Height (cm)	Number of branches/plant	Survival (%)
T_1	3.46	41.21	2,458.14	40.83	3.46	93.00
T_2	4.00	46.25	2,449.00	44.76	3.67	94.33
T_3	4.57	53.33	2,826.56	47.33	4.20	94.67
T_4	5.17	59.00	2,795.03	51.83	4.50	95.67
T_5	5.46	60.67	2,840.20	55.50	4.83	96.00
T_6	5.90	62.66	2,937.56	59.66	5.33	96.00
T_7	6.67	72.33	3,012.50	63.33	5.93	97.67
T_8	3.15	30.31	2,234.76	30.50	3.66	91.00
SEm(±)	0.13	2.51	45.92	1.13	0.18	0.89
$CD_{0.05}$	0.40	7.61	138.86	3.42	0.53	2.71

T_1: Konkan Annapurna briquettes (KAB) 4/plant, T_2: KAB 4 + indole butyric acid (IBA) 1,500 ppm/plant, T_3: KAB 4 + gibberellic acid (GA) 1,500 ppm/plant, T_4: KAB 4 + *Azotobacter* 4 g/plant, T_5: KAB 4 + IBA 1,500 ppm + *Azotobacter* 4 g/plant, T_6: KAB 4 + GA 1,500 ppm + *Azotobacter* 4 g/plant, T_7: KAB 4 + IBA 1,500 ppm + GA 1,500 ppm + *Azotobacter* 4 g/plant, T_8: Absolute control

CONCLUSION

It can be concluded that the balanced combination of growth promoters, biofertilizers and nutrient sources significantly improved the growth performance of patchouli under nursery. Treatment of Konkan Annapurna briquettes 4 + indole butyric acid (IBA) 1,500 ppm + gibberellic acid (GA) 1,500 ppm + *Azotobacter* 4 g per plant was observed significantly superior over all other treatments and improved overall growth of patchouli at 45 DAS under nursery condition.

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