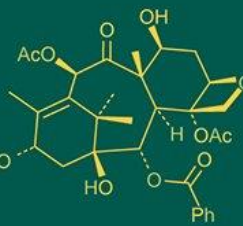
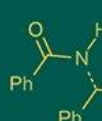


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Growth performance of chamomile under different plantations in the Konkan region of Maharashtra

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Abstract

Chamomile is an important medicinal and aromatic plant known for its medicinal properties and essential oil production. This study evaluated the growth performance of chamomile under different plantations in the Konkan region of Maharashtra in the year 2025-2026. Six treatments as T₁-Suru, T₂-Cashew, T₃-Mango, T₄-Bamboo, T₅-Paddy field and T₆-Control with four replications were assessed for various growth attributes of the chamomile plant at the experimental farm of Tetawali Block of Central Experimental Research Farm, Wakavali, DBSKKV, Dapoli. Significant differences among the treatments in plant height and number of tillers were observed; treatment T₃ (Mango) was the best for plant height (41.78 cm) and number of tillers (21.66). However, there was no effect of different plantations on the plant's survival percentage, indicating its broad adaptability to various soil and climatic conditions. Therefore, cultivation of chamomile under Mango-based plantations may be suggested for achieving better growth performance and efficient utilization of plantation spaces in the Konkan region of Maharashtra.

Keywords: Chamomile, plantations, Konkan, medicinal properties

1. Introduction

India is one of the world's mega-biodiverse countries, harbouring a rich diversity of medicinal and aromatic plants. Out of 45,000 plant species reported in the country, 3,500 species possess medicinal value (Chatterjee, 2001) [6]. Among these, Chamomile (*Matricaria chamomilla* L.), a member of the Asteraceae family, is a highly valued medicinal plant having diverse therapeutic applications (Singh *et al.*, 2011). The term 'Chamomile' is derived from the Greek word meaning 'ground apple' due to its apple-like fragrance. It is considered a symbol of wealth, harmony, love, tranquillity, and purification (Aaqil *et al.*, 2022) [1]. It is represented by two common varieties, viz., German Chamomile and Roman Chamomile. The present study focuses on German Chamomile (*Matricaria chamomilla*). A number of bioactive chemicals are responsible for the health benefits of chamomile. Compounds such as chamazulene and α -bisabolol exhibit anti-inflammatory, antimicrobial, and antispasmodic properties (Catani *et al.*, 2021) [5]. The essential oil produced from Chamomile is called "Blue Oil" in the market and is used to treat the common cold, diarrhoea, gastrointestinal conditions, haemorrhoids, osteoporosis, diabetes, and insomnia (Aaqil *et al.*, 2022) [1]. The global chamomile oil market was valued at \$412.6 million in 2025 and is projected to reach \$718.4 million by 2034, expanding at a compound annual growth rate (CAGR) of 6.3% during the forecast period 2026 to 2034 (<https://dataintelo.com/report/global-chamomile-oil-market>).

In the world, Germany is known as the largest producer of German chamomile, producing high-quality chamomile for medicinal and cosmetic purposes (Ghulane *et al.*, 2024) [8]. In India, it is cultivated mainly in the states viz., Jammu and Kashmir, Uttar Pradesh, Uttarakhand and Assam. Chamomile crop can be grown on a wide range of soils, but fine-textured soil with no waterlogging conditions is preferred. Well-drained, crumbly, levelled and slightly slopy soil promotes good establishment of plants. It grows well at a temperature range of 30-32 °C with a humidity of 40-50%. For optimal growth, chamomile requires weekly irrigation due to its shallow roots (Abdulrazaq *et al.*, 2024) [2]. After 65-70 days after transplanting, flowers are ready for the first picking; following pickings should be done every 15 days.

The present study focuses on cultivating Chamomile as an intercrop between different plantations in the Konkan region under popular Agroforestry systems. Agroforestry is a powerful, multifunctional land management approach that simultaneously enhances soil health, biodiversity, and farmer income through integrated tree-crop systems. Cultivating high-value cash crops, such as medicinal and aromatic herbs, along with multipurpose tree species, is a profitable alternative to traditional cropping systems (Jat and Thakur, 2012) [11]. In the Konkan region, after harvesting paddy, the fields retain high moisture levels, so the cultivation of chamomile can help utilise this residual moisture and maintain the fields. Chamomile can also be used as a cover crop in plantations to prevent soil erosion, a significant concern in the sloping terrains of the Konkan region. The crop matures within 90-120 days, which allows farmers to cultivate chamomile as an intercrop with other major crops like Mango, Bamboo, and cashew nut. This also maximises the land available for use across the different plantations. Thus, integrating chamomile into agroforestry models may enhance land-use efficiency, provide additional income to farmers, and promote ecological sustainability.

2. Materials and Methods

2.1 Experimental site

The field experiment was conducted at the experimental farm of the Tetawali Block of the Central Experimental Research Farm of Dr Balasaheb Sawant Konkan Krishi Vidyapeeth (DBSKKV), Dapoli, from November 2025 to March 2026. The geographical coordinates of the study area are 17°43'38.1" N Latitude and 73°17'43.8" E Longitude with an altitude of 250 m above sea level. According to the agroclimatic zones of Maharashtra, this area comes under the very high rainfall zone. The minimum and maximum temperatures range between 9.6 °C and 39 °C, respectively, and the Relative humidity ranges between 35% and 95%. The soil of the experimental site has low electrical conductivity and is slightly acidic, with a pH range from 5.05 to 5.67.

2.2 Experimental design and treatment details

The field experiment was laid out in a Randomized Block Design with six treatments and four replications. The details of the treatments are represented in Table 1. The numerical data of all the components were subjected to analysis of variance (ANOVA) using a randomised block design.

Table 1: Treatment details of the experiment

No.	Treatments	Plantations
1.	T ₁	Suru (<i>Casuarina equisetifolia</i>)
2.	T ₂	Cashew (<i>Anacardium occidentale</i>)
3.	T ₃	Mango (<i>Mangifera indica</i>)
4.	T ₄	Bamboo (<i>Dendrocalamus stocksii</i>)
5.	T ₅	Paddy cultivated field
6.	T ₆	Control (open)

2.3 Nursery raising

The seeds (var. CIM-Sammohak) were used as a planting material. For this purpose, healthy Chamomile seeds were collected from the CSIR-Central Institute of Medicinal and Aromatic Plants (CSIR-CIMAP), Lucknow, Uttar Pradesh. Seeds were raised in the nursery until they were 30 days old and had reached a height of 8-12 cm.

2.4 Field preparation, layout & Transplanting

The well-pulverised and levelled field was used for transplanting chamomile. FYM was added to the soil at 5 Kg in Plot-1 and well blended. Flat beds of size 2 m × 2 m were made. Each treatment was replicated 4 times, with 26 plants per replication, for a total of 104 plants per treatment. Then, the plots were irrigated a day prior to transplanting. Then, one-month-old seedlings were planted at a spacing of 50 cm × 30 cm, at a depth of 2-3 cm.

2.5 Growth parameters

2.5.1 Survival percentage

The survival percentage was recorded after 30 days of transplanting. The number of plants that survived per replication per treatment was counted by using the following formula:

$$\text{Survival percentage} = \frac{\text{Number of surviving plants}}{\text{Total number of plants planted}} \times 100$$

2.5.2 Plant height (cm)

The plant height was measured with a Scale in centimetres from the base to the highest tip of the shoot. The first observation was taken at the time of planting, and subsequent observations were taken at 30-day intervals.

2.5.3 Number of Tillers (nos. plant⁻¹)

The number of tillers in selected plants was counted separately for each treatment and expressed as counts at 30-day intervals. The first observation was taken at the time of planting, and subsequent observations were taken at 30-day intervals.

3. Results and Discussion

The data in Table 2 shows the effects of different plantations on the growth attributes of chamomile plants at 90 days after transplanting.

No significant difference in the survival percentage of chamomile across treatments was observed. All treatments (T₂ to T₆) had a 100% survival rate, except Suru (T₁), which recorded 82.29%.

A significant difference was recorded in the heights of chamomile plants. The highest plant height was recorded in treatment T₃-Mango (41.78 cm), while the lowest plant height was recorded in cashew T₂ (16.91 cm).

The highest number of tillers was observed in T₃-Mango (21.66 nos). The lowest number of tillers was observed in T₂-Cashew (7.58 nos). The sequence of tiller numbers across treatments was as follows: T₃ > T₄ > T₁ > T₅ > T₆ > T₂.

Table 2: Effect of different plantations on growth attributes of Chamomile plant

Treatment	Survival (%)	Plant height (cm)	Number of tillers (plant ⁻¹)
T ₁ -Suru	82.29	20.30	13.27
T ₂ -Cashew	100.00	16.91	07.58
T ₃ -Mango	100.00	41.78	21.66
T ₄ -Bamboo	100.00	28.60	14.13
T ₅ -Paddy field	100.00	25.21	11.80
T ₆ -Control T ₆	100.00	17.69	08.40
SE (m)	4.830	0.882	0.708
CD (5%)	NS	2.682	2.152
C.V.	9.953	7.031	11.049

The survival percentage of chamomile is important to evaluate its adaptability under varying environmental conditions. The 100% survival reported for Cashew, Mango, Bamboo, Paddy, and Control may be due to chamomile's inherent adaptability to diverse environmental conditions. Salimi *et al.* (2016) ^[14], Baghalian *et al.* (2011) ^[3] reported that chamomile is adaptable to a wide range of climates and soils. Further, the plant has been reported to exhibit wide adaptability over soil types, cold as well as alkalinity, which facilitates successful establishment of the plant under various conditions (Chauhan *et al.*, 2021) ^[7].

In the current study, the maximum plant height of 41.78 cm was recorded in the mango plantation at 60 days after transplanting. This may be due to the favourable microclimatic conditions created by the mango trees. Rodrigues *et al.* (2018) ^[13] reported that a mango orchard may improve the understory microclimate by reducing maximum air temperature and air thermal amplitude. Gupta *et al.* (2020) ^[9] observed that mango plantations have a dense canopy, and light interception is only 30-40 percent; the shade has a profound influence on the growth of the medicinal plant. These results are in conformity with Bari and Rahim (2010) ^[4], who observed the highest plant heights of Asparagus and Misridana in Mango-based multistoried agroforestry systems.

In the present study, the highest number of tillers in chamomile plants was observed under the Mango plantation (21.66), which was significantly higher than all other treatments. This may be attributed to enhanced vegetative growth of the plant because of the low light intensity under the mango canopy. Shade might have reduced the evaporation rate of water from the soil, which caused the availability of moisture to the intercrop. This would probably have increased the nitrogen supply to the intercrop via water absorption, which might have led to greater vegetative growth in the intercrop. Gupta *et al.* (2020) ^[9] found the enhanced vegetative growth of the plant under mango plantation. These results are similar to those of Bari and Rahim (2010) ^[4], who observed a greater number of tillers in the Misridana plant under the Mango-based agroforestry system.

4. Conclusion

The findings of this research demonstrate that different plantations significantly influence the growth and development of the chamomile plant. However, the treatments had no significant effect on survival percentage, which displays the capability of chamomile to establish under most plantation conditions. Among the tested treatments, mango plantation emerged as the most effective plantation, enhancing the growth of the plant. Therefore, cultivation of chamomile under Mango-based plantations may be suggested for achieving better growth performance and efficient utilization of plantation spaces in the Konkan region of Maharashtra.

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