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**Vivek S Devaranavadagi**
AICRP-DLA, Regional Agricultural Research Station, VIjayapura, Karnataka, India

**Ramesh Beerge**
AICRP-DLA, Regional Agricultural Research Station, VIjayapura, Karnataka, India

**GS Yadahalli**
AICRP-DLA, Regional Agricultural Research Station, VIjayapura, Karnataka, India

**Corresponding Author:**
**Vivek S Devaranavadagi**
AICRP-DLA, Regional Agricultural Research Station, VIjayapura, Karnataka, India

# Comparative performance of Ajwain (*Trachyspermum ammi* L.) varieties in Northern Dryzone of Karnataka

**Vivek S Devaranavadagi, Ramesh Beerge and GS Yadahalli**

**Abstract**
A frontline demonstration of Ajwain (*Trachyspermum ammi* L.) was aimed to improve the production after bringing new variety into cultivation in Bijjaragi village of Vijayapur district in northern Karnataka. Studies were carried out to assess yield and economics of a new variety AA-1 at the farmer's field for two years (2021-22 to 2022-23). Among different Ajwain varieties AA-1 recorded significantly higher yield (1155 and 1130 kg $ha^{-1}$) as compared to local variety Kadapa (795 and 840 kg $ha^{-1}$). Similar trend was observed for growth and yield parameters. The highest gross returns (179450 and 177854 Rs. $ha^{-1}$) and BC ratio (4.15 and 4.20) for 2021-22 and 2022-23 respectively were realized with AA-1 variety as compared with farmer's variety Kadapa.

**Keywords:** Ajwain, AA-1, Kadapa, Northern Karnataka, Dry zone, yield and economics

## Introduction
India is well known as "land of spices" across the world since long back. We have been cultivating these precious spices for fulfilling our various needs since ages. The seed spices have emerged as one of the important group of spice crops in India. India is the largest producer, consumer and exporter of seed spices in the world. The seed spices account for about 45% and 18% of the total area and production of spices in the country.

Ajwain is a cold-loving crop that is primarily grown in India during the *rabi* season. It is also grown as a late *kharif* crop in various parts of the country. Plant development and flowering are aided by a moderately chilly and dry atmosphere. High humidity should be avoided, especially after flowering. Insect pests and a variety of diseases thrive in humid, overcast conditions. During its growth period, it requires a temperature of 15-27 °C and a relative humidity of 60-70%, as well as relatively warm weather for seed development. The crop, on the other hand, has a moderate level of drought resistance and a wide range of environmental adaptation, as it can also be cultivated in the *kharif* season. Ajwain can grow in a variety of soils, but it prefers well-drained loamy soils. If suitable drainage facilities are available, organic matter-rich clay-loam soil can also be employed.

Ajwain, a member of the Apiaceae family, is an Egyptian native and a major seed spice crop in India. It's a little egg-shaped grayish brown annual herbaceous plant with small egg-shaped grayish brown fruits. The crop is densely branching, with a height of 69-90 cm and silky fine hair. It has feathery leaves with 2-3 pinnately split and linear segments. Flowers in a complex umbel at the end of the flowering stem. Cross-pollination occurs through insects, and the blooms are foreboding. Ajwain seed nutritional composition varies depending on cultivar, area and harvest stage. Moisture (8.9%), protein (15.4%), fat (ether extract) (18.1%), crude fibre (11.9%), carbs (38.6%), mineral matter (7.1%), calcium (1.42%), phosphorus (0.30%), iron (14.6 mg/100 f) and a calorific value of 379.4 per 100 g are all present in the seed (Pruthi, 2001). The adaptation of a variety to the soil and climatic conditions, as well as its resistance to pests and diseases, are the most important factors in its selection. In various places, multiple kinds have been released for cultivation. The crop, on the other hand, does not fare well in sandy or gravely soils. The thick soils are good for rainfed ajwain cultivation due to their great moisture retention. Although the crop is salinity tolerant, it produces larger yields and better leaf quality on neutral soils with a pH range of 6.5 to 7.5. As a result, it should generally be avoided in soils that are saline, alkaline, or acidic.

The Ajmer ajwain-1 (AA-1) variety was developed at NRCSS, Ajmer, as a consequence of recurrent selection from the Pratapgarh local. It may be grown in both irrigated and rainfed environments. Plants average 112 cm in height and 219 umbels per plant.

It is a long-season cultivar that matures in about 165 days. The variety has a high yield potential, with an average yield of 14.26 q/ha when irrigated and 8.8 q/ha when rainfed. This variety's seeds have a 3.5 percent essential oil content. In this context, the current study aims to provide a snapshot of the state of ajwain production in northern Karnataka so that relevant policies can be implemented to increase output.

**Methodology**

Frontline demonstration was carried out during the late *kharif* season of 2021-22 and 2022-23 under Northern Dryzone of Karnataka at Bijjaragi village of Vijayapur district (situated at 16° 51' N latitude, 75° 38' E longitude and at an altitude of about 636 m above mean sea level). With the improved package of practice, demonstration was carried out by taking 0.4 ha as a unit and covered a total area of 6.0 ha. The trial was carried out with 2 treatments ($T_1$=Farmers variety, $T_2$= AA 1 variety) and 15 replications under randomized complete block design in the farmer's field. The soil should be brought to fine tilth for good germination and plant growth. The first ploughing should be done by mould board plough followed by 2-3 light ploughing by harrow or cultivator. Each ploughing should be followed by planking to conserve the moisture. The soils of demonstration field for evaluating ajwain crop was deep clay soil with pH 7.3, available organic carbon 0.41 per cent, available N, P and K were 249.8, 37.4 and 466.2 kg $ha^{-1}$, respectively.

Sowing of ajwain was taken up in two consecutive years on 21st August 2021 and 24th August 2022 at farmer's field. Seeds of ajwain variety (AA-1) procured from NRCSS, Ajmer and were sown in line using drill sowing and seed rate of ajwain was 5.0 kg $ha^{-1}$ in both the year. Weeds were controlled through one hoeing at 30 days after sowing and one manual weeding. The recommended rate of N (100 kg $ha^{-1}$) and $P_2O_5$ (50 kg $ha^{-1}$) was applied for ajwain at the time of sowing. The remaining cultivation practices were followed as per the package of practice of UAS, Dharwad.

In each year a pre-seasonal training and two trainings during the crop period were conducted to prepare the farmers on implementation of selected package of practices. Ajwain was harvested on 18th and 11th February 2022 and 2023, respectively. The crop was harvested with sickles or manually and stacked for drying, kept the bundles upside down and then threshed to separate the fruits by beating with sticks. Five randomly selected plants from 15 sites in each treatment were harvested. Standard procedures were used to measure the yield attributes and yield parameters of ajwain. Variables were analyzed and least significance difference (LSD) test was carried out for analyzed mean square errors using Web Based Agricultural Statistics software Package (WASP 2.0). Significance and non-significance difference between treatments was derived through procedure provides for a single LSD value (Gomez and Gomez, 1984) [1]. Correlation studies among the yield components of ajwain was done using XLSTAT package.

**Results and Discussion**

**A. Effect on plant height**

The data on the influence of different ajwain varieties on plant height at 45, 90, 135 DAS and at harvest are presented in Table 1. It concluded that the plant height of ajwain increased with the advancement of crop age. AA-1 variety significantly increased the plant height by 11.51 and 12.84 per cent over the farmer's variety (Kadapa) for 2021 and 2022, respectively. The maximum plant height at harvest was recorded in AA-1 variety (79.40 and 77.30 cm) for 2021 and 2022, respectively. Whereas, the least plant height was found in farmer's variety (Kadapa). The variation in plant height as a result of genetic makeup of genotype and its interactivity with the favorable agro climatic and soil condition. Parsoya *et al.,* (2018) [3] concluded that sole ajwain cultivation resulted in higher plant height and number of branches per plant at 60 DAS, 90 DAS and at harvest as compared to different intercropping system.

**Table 1:** Plant height (cm) of ajwain as influenced periodically by different treatments

| Treatments | Days after sowing | | | | | | At harvest | |
|---|---|---|---|---|---|---|---|---|
| | 45 DAS | | 90 DAS | | 135 DAS | | | |
| | 2021 | 2022 | 2021 | 2022 | 2021 | 2022 | 2021 | 2022 |
| Farmers practice, Kadapa ($T_1$) | 16.25 | 16.10 | 48.35 | 50.20 | 65.70 | 67.40 | 71.20 | 68.50 |
| Ajmer ajwain, AA 1 ($T_2$) | 20.30 | 20.05 | 61.50 | 60.00 | 72.80 | 78.10 | 79.40 | 77.30 |
| SEm ± | 1.342 | 1.316 | 4.372 | 3.274 | 2.375 | 3.566 | 2.719 | 2.884 |
| CD (0.05) | 4.052 | 3.954 | 13.102 | 9.782 | 7.158 | 10.675 | 8.158 | 8.785 |

**B. Effect on number of branches**

The vegetative and reproductive development of the crop culminating into economic yield was the terminal outcome of growth, which was affected by continuously interaction occurring between environment and plant physiological process. The maximum number of branches per plant was observed in AA-1 variety (16.80 and 16.60) for 2021 and 2022 respectively. AA-1 variety significantly increased the number of branches per plant by 20.00 and 17.73 per cent over the farmer's variety (Kadapa) for 2021 and 2022 respectively (Table.2).

**Table 2:** Number of branches $plant^{-1}$ of ajwain as influenced periodically by different treatments

| Treatments | Days after sowing | | | | | | At harvest | |
|---|---|---|---|---|---|---|---|---|
| | 45 DAS | | 90 DAS | | 135 DAS | | | |
| | 2021 | 2022 | 2021 | 2022 | 2021 | 2022 | 2021 | 2022 |
| Farmers practice, Kadapa ($T_1$) | 5.40 | 5.20 | 11.00 | 11.20 | 13.50 | 13.85 | 14.00 | 14.10 |
| Ajmer ajwain, AA 1 ($T_2$) | 6.60 | 6.30 | 12.30 | 13.10 | 16.80 | 16.45 | 16.80 | 16.60 |
| SEm ± | 0.417 | 0.375 | 0.430 | 0.631 | 1.091 | 0.860 | 0.928 | 0.818 |
| CD (0.05) | 1.254 | 1.150 | 1.295 | 1.896 | 3.284 | 2.586 | 2.779 | 2.458 |

**C. Effect on yield and economics**

It is evident from the data presented (Table. 3) that the highest yield was registered in AA-1 variety, 1155 kg ha$^{-1}$ (2021) and 1130 kg ha$^{-1}$ (2022) (Table.3). AA-1 variety increased the yield by 45.28 per cent (2021) and 34.52 per cent (2022) over the farmer's variety (Kadapa). These results are in good agreement with Hasan *et al*., (2017) [2] who concluded that intercropping patterns significantly decreased the yield and yield components of ajwain and isabgol. The maximum seed yield of ajwain (2309 kg ha$^{-1}$) and isabgol (539 kg ha$^{-1}$) were obtained in sole cropping.

**Table 3:** Yield and economics of ajwain as influenced periodically by different treatments

| Treatments | Yield (Kg ha$^{-1}$) | | Gross return (Rs ha$^{-1}$) | | Net return (Rs ha$^{-1}$) | | B:C ratio | |
|---|---|---|---|---|---|---|---|---|
| | 2021 | 2022 | 2021 | 2022 | 2021 | 2022 | 2021 | 2022 |
| Farmers practice, Kadapa ($T_1$) | 795 | 840 | 143888 | 136584 | 102310 | 98411 | 3.05 | 3.16 |
| Ajmer ajwain, AA 1 ($T_2$) | 1155 | 1130 | 179450 | 177854 | 138540 | 135124 | 4.15 | 4.20 |
| SEm ± | 119.7 | 96.45 | 11853.2 | 13755.2 | 12076.6 | 12236.2 | 0.356 | 0.342 |
| CD (0.05) | 359.6 | 289.4 | 35561 | 41269.5 | 36231 | 36712.5 | 1.105 | 1.042 |

## Conclusion

Frontline demonstration was effective changing of farmers towards the adoption of new varieties in ajwain production. Most of the farmers became aware about recommended production practices of ajwain after conducting the frontline demonstration on farmers field. The economic details of the demonstrations give us a green signal to further popularize AA-1 ajwain variety to the farming community for large scale adoption. It can be concluded from the study that increased ajwain yield was due to the adoption of improved varieties. On the basis of results obtained during the course of present field demonstration it is concluded that, under rainfed conditions of northern Karnataka AA-1 ajwain variety is found significant in enhancing the productivity.

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