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# Performance Evaluation of High-Yielding Pearl Millet Varieties Under Rainfed Condition in Theni District Tamil Nadu

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**Abstract**

Bajra or pearl millet (*Pennisetum glaucum*) is the third most important millet crop in the world in aspects of area and production, food and nutritional security. It is the fourth most important food crop grown in India, after rice, wheat and Maize. During 2019-2020, it covers an area of 6.93 million hectares with 8.61 million tonnes of average production and 1243 kg/ha productivity. The main problem of the pearl millet growers in the Theni district of Tamil Nadu state is getting low yields (16.71 q/ha) under rainfed conditions due to the non-availability of high-yielding varieties and lack of knowledge about good agricultural operations. The present research planned to study the growth and yield performance of different short-duration and high-yielding pearl millet varieties in the rainfed region of the Theni district of Tamil Nadu. The highest yield was recorded in CO 10 (33.64 q/ha), followed by AHB 1200. This was due to the highest number of productive tillers and longest ear head length in CO 10. CO 10 recorded a higher yield (33.64q/ha) which was 40.75 % and 49.06 % higher than AHB 1200 and ICMV 2217. Among the varieties, CO 10 recorded the highest net return of Rs. 54512. The benefit-cost ratio is the final and most impactful criterion from the farmer's side for adoption of the most benefitable technology and variety for sustainable livelihood.CO10 recorded a BCR of 4.31, followed by AHB 1200 (2.79). The farmer's practice (ICMV 2217) recorded the lowest BCR of 2.71. The field trial concluded that cultivation of the CO 10 pearl millet variety was highly suitable and a better choice for farmers in terms of better growth, higher yield and monetary return during the kharif season under rainfed conditions in Theni District, Tamil Nadu.

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## Introduction

Bajra or pearl millet (*Pennisetum glaucum*) is the third most important millet crop in the world in aspects of food and nutritional security and drought-tolerant nature. It is the fourth most important food crop grown in India.[1] During 2019-2020, it has been

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cultivated in an area of 6.93 million hectares with 8.61 million tonnes of production with a productivity of 1243 kg/ha. It prevails over all the other cereal crops like sorghum and maize falling apart to deliver economical yields due to its distinctive features like high photosynthesis, strong ability to produce dry matter and withstand ability under the most intense droughts, and early maturity in nature. India alone shares 40.51 percent of pearl millet production in the world production of millets in 20202. In India, Andra Pradesh, Karnataka, Rajasthan, Gujarat, Uttar Pradesh, Maharastra, Tamil Nadu and Madhya Pradesh are the main pearl millet-producing states. In the year 2021-22, 58 percent of production was contributed from pearl millet. In Tamil Nadu, the pearl millet cultivation area is 67410 ha with a production of 158890 tonnes (India data insights).

In 2018, the Indian Government announced 2018 as the National Year of Millets and 2023 as the International Year of Millets, declared by the Food Agricultural Organization and the United Nations. The major goal is to raise knowledge about the benefits of their farming methods and mainstream millets to make use of their nutraceutical and nutrient-rich qualities. India is growing more than 70000 ha of biofortified pearl millet. The On-Farm Testing is an important mandated activity in KVK for the evaluation of suitable location-specific technologies for higher income and yields in the specific location of the district. The main problem of the pearl millet growers in the district is getting low yields (16.71 q/ha) under rainfed conditions due to the non-adoption of high-yielding varieties and lack of knowledge about good agricultural operations. The present research planned to study the growth and yield performance of different short-duration and high-yielding pearl millet varieties under a rainfed region of the Theni district of Tamil Nadu. The varieties that are selected for this trial are highly suitable for the location, drought-tolerant in nature and high-yielding performance under the rainfed conditions.

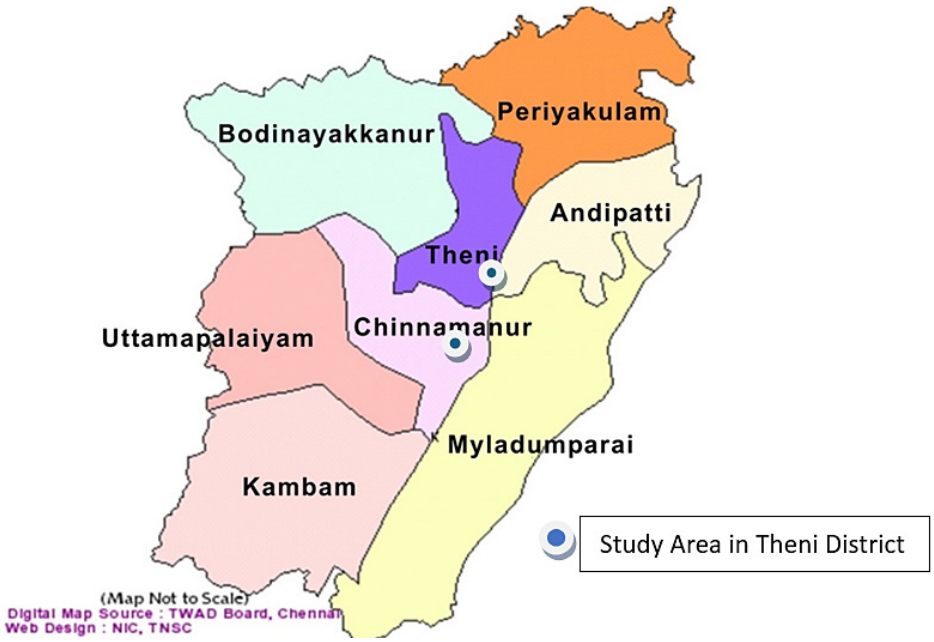


**FIG. 1 : Study Area Map**

**Materials and Methods**

The research trial was conducted during Kharif 2023 at two similar locations in Theni district, to evaluate the growth, yield and economic performance of different pearl millet varieties of the rainfed region of Theni district of Tamil Nadu. The trail plot comes under the western agroclimatic zones of Tamil Nadu with annual precipitation of 831 mm which was spread over 90 rainy days.[2] The precipitation during the crop period is 418 mm. The annual evapo-

transpiration in the trail plot is 967 mm. The soil type of the plot is red sandy loam with low organic carbon (0.21-0.38 %), high available nitrogen (241-287 kg/ha), medium available Phosphorus (11.43-12.70 kg/ha) and medium available potassium (161-175 kg/ha). The present study is laid out in Randomized Block Design with three treatments and five replications as per the methods suggested by Panse and Sukhatme.[3] The plot size is 20 $m^2$. The data were collected during regular intervals and the harvest stage and analysed in the RBD ANOVA test and presented.

**Table 1: Characteristics of Pearl Millets Varieties**

| Name of the technology/variety | Source and year | Special features |
|---|---|---|
| TO 1-Farmers Practice – ICMV 221 | CRIDA, Hyderabad (1993) | Duration: 75- 80 Days, medium tall, semi- compact ear heads. Average yield 19.34 q/ha. |
| TO 2-Pearl Millet AHB 1200 | NARP, Aurangabad (2018) | Duration: 75-80 days, long cylindrical panicle, resistant to downy mildew. Average yield:31.70 q/ha |
| TO 3-Pearl Millet CO 10 | entre for Plant Breeding and Genetics, TNAU (2016) | Duration: 85-90 days, High yielding, Medium height, Compact and bold seed, Resistant to downy mildew. |

Three improved pearl millet varieties were chosen for the field trials. The trial plot was ploughed four times with 5 tyne cultivators. The ridges are formed with a spacing of 45 cm. The seeds are treated with 4 g of *T. viride*/kg of seed. The hand weeding was done on 20 DAS and 40 DAS for effective weed control in the trial plot. As per the package of practices,70 kg Nitrogen 35 kg Phosphorus and 35 potassium are applied as recommended dose pr ha Appropriate. Need-based measures for plant protection and recommended packages of various practices were taken to control pests and diseases. Data were recorded regarding the duration of crop maturity, growth attributes like plant height (cm) and yield attributes like the number of productive tiller per plant, ear head length (cm) and gran yield (q/ha).

**Table 2: Weekly Details of Temperature and Rainfall During the Crop Period – Kharif 2023**

| Period (fortnight) | Rainfall (mm) | Average Temperature (Degree Celsius) |
|---|---|---|
| June 25- July 1 | 80 | 28.52 |
| July 2- 15 | 47 | 29.31 |
| July 16-29 | 87 | 30.14 |
| July 30 – August 12 | 0 | 29.75 |
| August 13-August 26 | 42 | 29.05 |
| August 27- September 9 | 121 | 28.45 |
| September 10- September 23 | 40 | 27.10 |

**Results and Discussion**

The results are pertaining to the growth, yield parameters and economics presented in table 3. The duration of a crop variety is the most important character in the rainfed situation for getting yields at minimum resource utilization. Crop duration directly

coincides with the economic yield of the pearl millet under rainfed conditions. Pearl millet's normal crop duration is 100–110 days. The introduction of short-duration varieties helps to obtain more yield under a rainfed situation. The duration of different pearl millet varieties is presented in Table 3. ICMV 221 variety matured at 81 days, followed by AHB 1200 (83.66 days). T3 (CO 10) attained maturity at 91.16 days. The crops matured under 95 days produced more yields than long-duration crops in the region.

**Table 3: Growth and Yield Parameters of Biofortified Pearl Millet Varieties**

| Treatments | Duration (Days) | Plant height (cm) | No. of Productive tillers /plant | Ear head length (cm) | Yield (q/ha) |
|---|---|---|---|---|---|
| T1- ICMV 221 | 81.00 | 191.00 | 5.10 | 29.33 | 22.56 |
| T2- AHB 1200 | 83.66 | 204.83 | 5.70 | 18.96 | 23.90 |
| T3- CO 10 | 91.16 | 209.33 | 6.36 | 40.90 | 33.64 |
| **SEd** | **2.73** | **1.98** | **0.20** | **1.21** | **1.08** |
| **CD (5%)** | **6.30** | **6.46** | **2.40** | **2.80** | **2.50** |

The height of the plant rises as crop growth progresses is shown in Table 3. The maximum plant height (209.33 cm) was recorded by CO 10 (T3), followed by AHB 1200 (T2). This was due to nil incidence of downy mildew disease in CO 10. Crop height directly influenced the number of productive tillers per plant. The above results revealed that more plant height increased the number of productive tillers in CO 10 which also recorded 2.19 % and 9.59 % higher plant height than AHB 1200 and ICMV 221. Productive tiller per plant is the primary yield attributing character in pearl millet. Under rainfed circumstances or irrigated conditions, the number of productive tillers varied due to cultivar and field management practices. Table 3 revealed that productive tillers aspects in related to different treatments. The highest number of productive tillers per plant (6.36) was recorded in CO 10 (T3) followed by AHB 1200 (T2). CO 10 recorded 11.57 % and 24.70 % higher than ICMV 221 and ICMV 22.[4]

On successful completion of the vegetative stage, the plants enter the economic yield stage. The emergence of the ear head is the prime factor for achieving higher yield. The ear head lengths of three varieties are mentioned in Table 2. The highest ear head length was recorded (40.90 cm) in CO 10 (T3) followed by ICMV 221 (29.33 cm) (T2). This was due to the root-shoot ratio performance in the different cultivars and more photosynthesis due to plant height. Ear head length alone boosts the economic yield of the crop. CO 10 recorded 111.49 % and 36.72 % higher ear head length over AHB 1200 and ICMV 221.[4-7] The amount of rainfall received during the vegetative stage is around 100 mm which helps the plant to produce a greater number of productive tillers.

**Yield**

The yield recorded in three cultivars is mentioned in Table 4. The highest yield was recorded in CO 10 (33.64 q/ha) followed by AHB 1200. This was due to the highest number of productive tillers and longest ear head length in CO 10. CO 10 recorded 40. 75 % and 49.06 % higher yield over AHB 1200 and ICMV 221.CO 10 performs higher in rainfed conditions as compared to other pearl millet varieties in Tamil Nadu. CO 10 recorded a higher yield under rainfed condition.[6-8] CO 10 recorded a significantly higher yield under the rainfed condition with average rainfall in the vegetative and ear head emergence stage. During the trial period, there were no temperature variations recorded which was the natural face of the western agro-climatic region of Tamil Nadu. The good amount of rainfall received at a time of ear head emergence also helps to produce more grains per head and grain yield.

Table 4 depicts that the economics of different bio-fortified pearl millet varieties. Farmers preferred to cultivate and adopt high yield and profitable varieties for getting good price.

**Table 4: Economics of Biofortified Pearl Millet Varieties**

| Parameters/ Pearl Millet Variety | Cost of Cultivation (Rs.) | Gross return (Rs.) | Net return (Rs.) | Benefit Cost Ratio |
|---|---|---|---|---|
| ICMV 221 | 17570 | 47689 | 30119 | 2.71 |
| AHB 1200 | 18150 | 50716 | 32566 | 2.79 |
| CO 10 | 16466 | 70978 | 54512 | 4.31 |
| **SEd** | **37.66** | **835.92** | **499.97** | **0.07** |
| **CD ( 5 %)** | **854.75** | **1927.63** | **1152.93** | **0.18** |

Economic aspects are the main outcome of the technology or variety. The adoption rate and accessibility of new varieties are based on the economics of the varieties. The economic performance of the three varieties is presented in Table 3. Regarding the cost of cultivation, CO 10 registered the lowest cost of cultivation/ha Rs. 16466 followed by ICMV 221 (Rs.17570/ha) and AHB 1200 (Rs.18150/ha). Respectively Multiple resistant characteristics of CO10 variety led to resist Downy Mildew disease and reduced the plant protection cost. The Highest Gross Return (Rs.70978/ha) and Net Return (Rs.54512/ha) recorded in CO10 (T3) pearl millet variety were followed by AHB 1200 (Rs.50716/ha and Rs.32566/ha) (T2).

Regarding the Benefit Cost Ratio (BCR), CO10 (T3) recorded 4.31 followed by AHB 1200 (2.79) (T2). The Benefit Cost Ratio is the final and most impactful criteria from the farmer side for adoption of the most benefitable technology and variety for sustainable livelihood.

## Conclusion

It was concluded that the cultivation of CO 10 Pearl millet variety with integrated crop management practices registered the highest growth, yield and economic parameters. CO 10 Pearl millet variety recorded a 41 percent higher yield over the other varieties under the rainfed condition of the western agro-climatic region. Cultivation of CO 10 pearl millet variety was a better choice for higher yield and income under rainfed conditions of Theni District and also other parts of the western agro-climatic region, similar climatic conditions in Tamil Nadu. The performance of the CO 10 Pearl millet variety in the kharif season was very good. The district or region with similar climatic conditions and receiving rainfall during mid-June will adopt the CO 10 variety for higher yield and income. High rainfall after ear head emergence leads to reduce the grain-filling percentage.

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## Conflict of Interest

The authors do not have any conflict of interest.

## Data Availability Statement

The authors confirm that the data supporting the findings of the study are available within the article and its supplementary materials.

## Ethics Statement

This research did not involve human participants, animal subjects or any material that requires ethical approval.

## Author Contributions

- **Maheswaran Ponnumari:** Preparation of research design and treatments, data collection and analysis of data, writing of results and discussion.
- **Ramyasivaselvi Manoharan:** writing abstract and introduction, editing the result and discussion.

**References**


1. Annual Report, Directorate of Millets Development, Project Coordinator Review, 2020.
2. Dharani, C., Maraghtham N.,Geethalakshmi V.,Ramanathan Sp.,Balaji Kannan, ranfall variability analysis and trend assessment in Theni district of Tamil Nadu, India: An implication for crop planning. *Journal of agrometeorology,* 2022, 24(3),305-308
3. Panse V G and Sukhatme P V (1967). Statistical Methods for Agricultural Workers. Indian Council of Agricultural Research, New Delhi, p.381
4. Anuradha N., Kranthi Priya P., Patro T.S.S., Sandhya Rani Y,. Triveni U. Character association, variability and heritability studies for grain yield and its yield attributes in Pearl Millet (*Pennisetum Glaucam* (L.) R. Br). *Int. J. Curr. Microbiol. App. Sci.*, 2020, 11, 1459-1464.
5. Ramyasivaselvi M., Kowsalya S., Juliet Hepziba S. Biofortified Pearl Millet Varieties for sustainable agriculture among farming community in Theni District, Tamil Nadu. The Indian Journal of Nutrition and Dietetics, Millet Special Issue, October to December 2023: 65-77.
6. Sanjana Reddy P., Parashuram Patroti and Malathi V.M. Enhancing Productivity and nutrition with biofortified pearl millet cultivars. *Indian Farming,* 2023, 73, 30-32.
7. Sumathi P., Veerabadhiran R., Ravikesavan G.,Karthikeyan N., Meyyazhagan R., Poonguzhali C.R., Ananda kumar K., Ganesamurthy S., Revathi.,A. high yielding downy mildew disease resistant pearl millet composite CO 10. *Electronic Journal of Plant Breeding,* 2017 8(1): 111-116.
8. Yadava D.K., Choudhury P.R. Firoz Hossain and Dinesh Kumar. Biofortified Varieties: Sustainable Way to Alleviate Malnutrition. ICAR, New Delhi, 2017, 2.