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Performance Evaluation of Different Finger Millet (*Eleusine coracana* L. Gaertn.) Cultivars for Growth, Productivity and Nutrient Quality of Grains Under Hot and Subhumid Region of Odisha

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Abstract: Millets are cultivated world-wide and are more prominent in South Asian and African countries. Among different millets, finger millets hold a significant position in terms of area and productivity. Due to negligence in various cultivation practices and improper selection of genotypes, most farmers fail to achieve optimum yields. In this scenario, the choice of a suitable cultivar is essential. Considering the above, an experiment was conducted at Post Graduate Research Farm of Centurion University of Technology and Management, Odisha, to evaluate suitable cultivars of finger millet. The study consisted of eight treatments comprising of V_1: VL Mandua, V_2: Hima, V_3: Indravathi, V_4: Vegavathi, V_5: Champavathi, V_6: Suvarnamukhi, V_7: Bharathi, V_8: Sri Chaitanya. The treatments were replicated thrice and the randomized block design was implemented. The results revealed that the highest plant height (158 cm) was observed with the cultivar Bharathi. Indravathi recorded the highest dry matter accumulation at harvest (776 g m^{-2}), leaf area index at 50 DAT (3.56) and number of tillers at 50 DAT (66). However, the highest effective tillers per m^2 (2.3) were recorded with the cultivar Sri Chaitanya, and the highest number of grains per ear head and weight per ear head were registered in the Bharathi variety. Further, the highest numbers of fingers per ear head (8.4), 1000 grain weight (2.82g), weight of grains $hill^{-1}$ (6.72g) and length of finger (7.7cm) were recorded in the variety Indravathi. The cultivar Indravathi recorded the highest grain (2315 kg ha^{-1}), stover (5372 kg ha^{-1}) and biological yield (7687 kg ha^{-1}) and Sri Chaitanya followed it. The study concludes that Indravathi and Sri Chaitanya can be considered short-duration and Hima as long duration cultivar for obtaining higher yield during Kharif season (July to September) under the hot and subhumid regions of Odisha.

Introduction

Millets are small-grained coarse cereals that contain numerous unique species and traditional crops produced primarily by smallholders and tribal farmers in tropical climates. These are some of India's oldest cultivated crops (Maitra et al., 2000; 2022a). Millets are mostly annual plants belonging to the division of coarse cereals (Shiihii et al., 2011; Maitra et al., 2022b; 2023a). Given

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the nutritional values, small millets have recently been recognized as 'Nutri-cereals. Millets are climate-resilient crops with wider adaptability that can fit under erratic climatic conditions and provide satisfactory yield output and returns (Banerjee and Maitra, 2020). In these consequences under changing climate conditions, millets-based cropping systems have shown enough potential to achieve some of the Sustainable Development Goals (SDGs) such as "SDG 1 (no poverty), SDG 2 (zero hunger), SDG 3 (good health and wellbeing), SDG 13 (climate actions), SDG 15 (life on land)" across the challenging population of the world (Mukherjee et al., 2022; Maitra et al., 2023b). Hence, millets should be integral to the cropping system under irrigated and rainfed conditions for food, nutritional security, and agricultural sustainability (Priya et al., 2023; Sengupta et al., 2024; Chakrabarti et al., 2024). Their potential to thrive under environmental stress made them suitable crops for climate change and global warming, including dietary importance for food and nutritional security (Mallick et al., 2016; Mallick, 2017; Eseroghene and Ikechukwu, 2018; Brahmachari et al., 2018; Biswas et al., 2023).

Millets are classified into two types, namely, major and minor or small millets. Among different minor millets, finger millet (*Eleusine coracana* L. Gaertn), known widely in India as ragi, contributes significantly to the area under cultivation (Maitra, 2020). Finger millet alone produces approximately 85% of minor millet output in the country (Sakamma et al., 2018). Finger millet is an essential small millet with the potential to produce a significant amount of nutritious food grains despite inadequate resource and management settings (Shibairo et al., 2014; Dhara et al., 2026). Finger millet comprises carbohydrate (72 g), protein (7.3 g), fat (1.3 g), dietary fibre (11.8 g), mineral nutrients (2.7 g) and energy of 3.28 Kcal per 100 g of edible portion (Hiremath et al., 2018; Banerjee and Maitra, 2020). The dietary fibre in finger millet helps prevent hyperglycemia; phytates facilitate the prevention of stresses and phenolics and tannins function as cell reinforcements (Antony and Chandra, 1998). The crop has a wider adaptability, is easy to cultivate, is devoid of severe pests and disease attacks and is drought tolerant; this crop has become an automatic choice in dry farming systems. Sometimes, in areas where the finger millet crop is grown, this is the only crop that can provide a good yield (AICSMIP, 2013). In India, 1.19 m ha area produces 1.98 million t of finger millet grain with an average productivity of 1661 kg ha^{-1} (Sakamma et al*.,* 2018). India's leading states that are growing finger millet are Karnataka, Tamil Nadu, Andhra Pradesh, Odisha and Jharkhand. Odisha has the pride of growing finger millet in the southern region and planted in 1.17 lakh hectares, yielding 1.28 lakh tonnes of grains with a productivity of 1102 kg ha^{-1} (GoO, 2020). Once, South Odisha region was the homeland for different millets; however, because of the promotional activities in favour of major cereals, millets cultivation is only confined in the state among tribal farmers as it is mostly a rainfed crop with local cultivars (OMM and UNWFP, 2021).

Recognizing finger millet's nutritional value, the government of Odisha included it in the Public Distribution System (PDS), covering 16.01 million households. Recently, the government of Odisha took the initiative to promote the scheme of the Odisha Millet Mission. Furthermore, the government has set a procurement goal of one lakh quintals of finger millet for 2019-20 (GoO, 2024). In the south Odisha region, harsh and unfavourable weather conditions and less fertile soils made agriculture a gamble due to the high climatic risks. Under these consequences, it is a viable crop for resource-poor smallholders for ecological resilience (Mal et al*.,* 2010).

Finger millet productivity in the state is inferior to the national average because of the use of local cultivars, poor seed quality and improper stand establishment under direct seeding with inappropriate agronomic management (Maitra et al*.,* 2020). However, improved cultivars developed in India can produce grain yield of 3.5 to 4.0 t ha^{-1} (Prabhakar et al., 2017; Triveni et al*.,* 2017). Varieties play a pivotal role in production improvement and the environment as well as crop management determines the capacity yield expression within a genetic restriction (Anuradha et al*.,* 2022; Sharmilaa et al*.,* 2023).

Therefore, based on the above facts, the current research work was carried out to evaluate the performance of different finger millet *(Eleusine coracana* L. Gaertn.) cultivars for hot and subhumid regions of Odisha.

Materials and methods

The field trial was carried out at Post Graduate Research Farm (23^{0}39' N latitude, 87^{0}42' E longitude) of Centurion University of Technology and Management (CUTM), Odisha (Figure 1). The soil of the experimental area was sandy clay loam in texture and the region falls under typical hot and sub-humid climate. During the cropping period, the metrological data was collected from Agro-metrological Observatory of CUTM, Paralakhemundi (Table 1). The mean maximum temperature during the crop period varied from 25.9^{0}C to

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34.9^{0}C and minimum temperature ranged from 20.2^{0}C to 26.5^{0}C, respectively. The mean maximum relative humidity ranged between 87% and 65.2% and the minimum varied from 62.2% to 80.4%. The crop received 847 mm rainfall and the average bright sunshine hour recorded was 8.16 hours day^{-1}. The soil sample collected from the experimental field at a 0-30 cm depth using a soil agar. The soil's physico-chemical properties were analysed and it was sandy loam with a soil pH of 6.62 and an organic carbon of 0.68%. The soil contained 263 kg ha^{-1} of nitrogen, 12.9 kg ha^{-1} of phosphorous and 122.4 kg ha^{-1} of potassium.

The experiment was laid out in Randomized complete block design consisted of eight cultivars, namely, V_1: VL Mandua, V_2: Hima, V_3: Indravathi, V_4: Vegavathi, V_5: Champavathi, V_6: Suvarnamukhi, V_7: Bharathi, V_8: Sri Chaitanya. There were three replications in the study. The details of the varieties are described in Table 2.

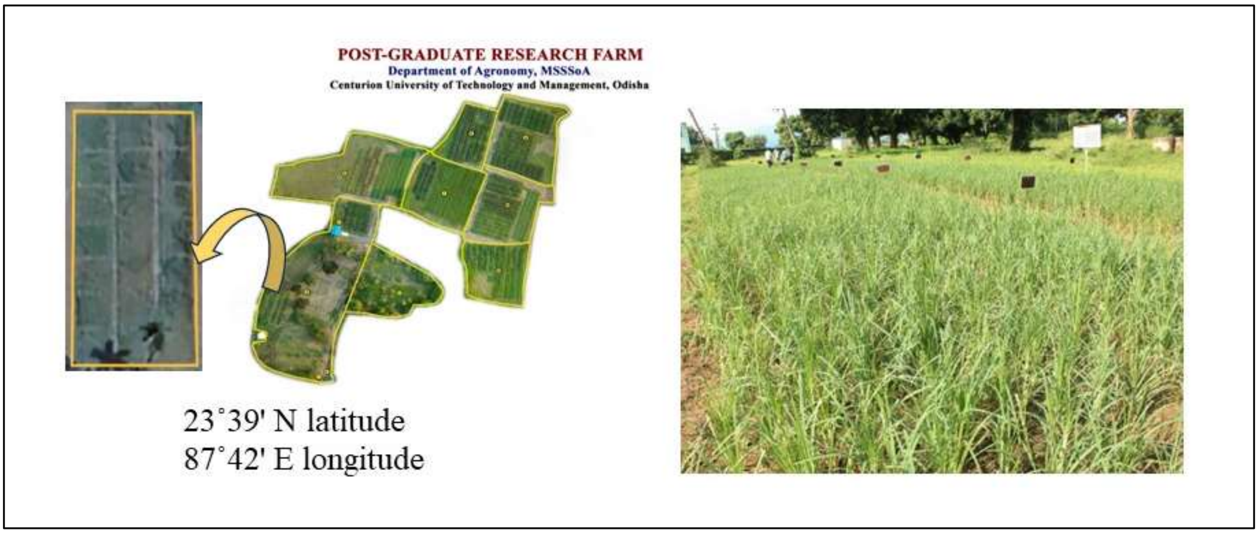

Figure 1. Experimental site.

Table 1. Meteorological observations (July to September, 2023).

Met. week	Period	Temperature (˚C)		Relative Humidity (%)		Rainfall (mm)	Sunshine (hrs. day^{-1})
		Max.	Min.	Max.	Min.		
July, 2023							
27	02 July - 08 July	34.9	26.5	83.7	72.4	50.6	7.3
28	09 July - 15July	32.5	26.4	83.6	70.7	15.5	6.5
29	16 July - 22 July	31.2	25.3	87.8	80.4	148.9	5.1
30	23july - 29july	32.6	25.8	89.2	77.4	212.6	6.5
August, 2023							
31	30 July - 05Aug	31.3	26.1	86.1	69.7	32.8	9.5
32	06 Aug - 12 Aug	34.5	25.9	85.7	70.7	23.8	11.0
33	13 Aug - 19Aug	32.9	25.1	86.0	73.9	63.5	9.1
34	20 Aug - 26 Aug	33.7	25.5	86.7	77.3	42.5	9.2
35	27 Aug - 02 Sept	34.7	25.2	87.2	69.3	9.6	3.5
September, 2023							
36	03 Sept - 09 Sept	31.9	25.8	89.7	80.1	106.9	8.3
37	10 Sept - 16 Sept	32.2	25.4	88.9	79.4	45.5	8.5
38	17 Sept - 23 Sept	32.4	25.2	88.1	78.1	41.3	8.5
39	24 Sept - 30 Sept	34.0	25.6	89.7	77.2	45.7	9.0

October, 2023							
40	01 Oct - 07 Oct	29.5	24.6	87.8	66.7	7.4	9.4
41	08 Oct - 14 Oct	35.3	23.3	89.1	65.1	0	9.7
42	15 Oct - 21 Oct	33.6	22.5	89.2	66.2	0.1	8.9
43	22 Oct - 28 Oct	32.2	22.6	89.8	67.7	0	9.3
November, 2023							
44	29 Oct - 04 Nov	31.6	22.2	87.4	66.1	0.1	7.9
45	05 Nov - 11 Nov	32.6	20.7	88.5	62.2	0.18	8.8
46	12 Nov - 18 Nov	32.2	20.2	86.7	59.8	0	7.2
Source: Agro-meteorological station, Centurion university, Paralakhemundi, Odisha, India.							

Table 2. Varietal details of the experiment.

Treatment	Cultivar name	Cultivar no.	Features
V_1	VL Mandua	352	Short-duration variety and also used for contingent crop planting.
V_2	Hima (w)	VR 936	Suitable for late conditions. Responsive to nitrogenous fertilizer.
V_3	Indravathi	VR 1101	Resistant to multiple diseases (finger blast, foot rot and neck blast), insect pests (grass hoppers, ear head caterpillar, grey weevil and aphids) and lodging.
V_4	Vegavathi	VR 929	Higher yielding and disease-resistant variety.
V_5	Champavathi	VR 708	Photo insensitive and early maturity.
V_6	Suvarnamukhi	VR 988	It can withstand terminal moisture stress and is resistant to all of blast and BLB. Suitable for rice-fallow-ragi cultivation.
V_7	Bharathi	VR 762	Moderately resistant to blast.
V_8	Sri Chaitanya	VR 847	Moderately resistant to blast.

An area of 18 m^2 was allotted for each treatment, and the treatment was replicated three times. 25 days old finger millet seedlings were transplanted with a row x plant spacing of 20 cm x 10 cm, respectively. One hand weeding was done at 25 days after transplanting (DAT) to keep the plots weed-free. Azoxystrobin 11% + Tebuconazole 18.30% SC @ 750 ml ha-1 was applied during 32 DAT and 45DAT to protect the finger millet crop from leaf blasts. During the experimental period, one irrigation was given as the crop received sufficient rainfall during all the growth stages. The data recorded at different crop growth stages and at harvest were considered for the statistical analysis by using analysis of variance (ANOVA), standard error of means (S. Em. ±) and critical difference at 5% probability level of significance (Gomez and Gomez, 1984). The Excel software was used for statistical analysis.

The leaf area index was calculated by the formula given by (Waston, 1958).

$$\text{Leaf area index} = \frac{\text{Total leaf area}}{\text{Ground area}}$$

And the leaf area duration of different cultivars was calculated by the following formula.

$$\text{Leaf area duration} = \frac{(L_1+L_2)}{2} \times (T_2 - L_1)$$

The finger millet grain's nutrient content was analysed using standard operational procedures. The grain's nitrogen was estimated using the Kjeldahl method (Baker and Thompson, 1992). The standard method was followed to determine potassium, phosphorus, calcium, magnesium, iron, manganese, zinc, and copper (Jackson, 1973). The potassium content in the sample was estimated in flame photometer (Jackson, 1973). For phosphorus content, colorimetric technique is employed and measured using spectrophotometer at 420 nm (Jackson, 1973).

The content of calcium, magnesium, and cationic micro-nutrients (iron, manganese, zinc, copper) in the plant samples (Lavilla et al. 1999) were determined by Perkin-Elmer Pinnacle 900F Atomic Absorption Spectrophotometer (using Sigma-Aldrich standards each of 1000 mg L^{-1}) with air-acetylene flame, at following instrumental parameters (Table 3).

Table 3. Specified wavelengths for micro-nutrient estimation in Atomic Absorption. Spectrophotometer

Element	Wavelength (nm)	Slit width (nm)
Calcium	422.7	0.7
Magnesium	202.6	0.7
Iron	248.3	0.2
Manganese	279.5	0.2
Zinc	213.9	0.7
Copper	324.8	0.7

Table 4. Growth attributes of finger millet as influenced by different cultivars.

Cultivars	Plant height at harvest (cm)	Dry matter at harvest (g m^{-2})	Leaf area index (50 DAT)	Number of tillers m^{-2} (50 DAT)	Leaf area duration (25 to 50 DAT) (day day^{-1})
VL Mandua 352	154	561	2.59	26	47.0
Hima (w) VR 936	130	693	2.9	51	55.7
Indravathi VR1101	149	776	3.56	66	69.2
Vegavathi VR 929	142	681	2.67	40	59.2
Champavathi VR 708	141	649	3.12	33	56.4
Suvarnamukhi VR 988	145	622	2.42	26	44.4
Bharathi VR 762	158	692	2.97	51	63.7
Sri Chaitanya VR 847	151	731	3.36	61	70.7
S.Em. (±)	5.1	25.1	0.2	1.8	2.1
C.D. (P= 0.05)	15.6	76.0	0.6	5.4	6.5
C.V. (%)	6.1	6.4	10.9	7.0	6.4

Results and discussion

Growth attributes

Finger millet cultivars showed significant differences in the expression of the growth attributes (Table 4). The plant height of finger millet at harvest recorded its significant superiority (158 cm) in the cultivar Bharathi and it was closely followed by and remained on par with VL Mandua, Sri Chaitanya, Indravathi and Suvarnamukhi. The remaining finger millet cultivars did not perform well and the least plant height (130 cm) was recorded with Hima. This can be due to the genetic variability of the genotypes, which resulted in significant differences in plant height of finger millet (Simion et al., 2020; Pandey et al., 2023). The maximum values of dry matter accumulation at harvest (776 g m^{-2}), leaf area index at 50 DAT (3.56) and number of tillers at 50 DAT (66) were recorded with the cultivar Indravathi. Further, it remained statistically at par with Sri Chaitanya and the remaining finger millet cultivars did not perform significantly in the expression of dry matter accumulation and number of tillers in the study. Moreover, Indravathi remained on par with Sri Chaitanya, Champavathi, and Bharathi in terms of leaf area index. The growth attributes are morphological traits which are highly stable genotypic characters. In the experiment, various finger millet cultivars showed differences in the growth parameters, which might be because of their genetic makeup (Sunder et al., 2016; Girisha et al., 2021; Nanja Reddy et al., 2021; Panda et al., 2021).

The highest leaf area duration calculated for 25–50 DAT (70.7 day day^{-1}) was noted with the cultivar Sri Chaitanya, which was closely followed by and remained statistically at par with Indravathi (Table 4). Moreover, the cultivar Suvarnamukhi registered the lowest leaf area duration during the study. The results conform to the findings of Babu et al. (2014) and Sunder et al. (2016).

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Yield attributes

Among the yield attributing characters, the maximum number of effective tillers per m^2 (2.3) was recorded with the cultivar Sri Chaitanya and it remained statistically at par with Indravathi and Hima (Table 5). The least number of effective tillers per m^2 was observed with the cultivar V L Mandua 352, which was closely followed by Champavathi and Bharathi (Nanja Reddy et al., 2019; Gohain et al., 2020). As the cultivar Sri Chaitanya registered maximum leaf area duration with considerable dry matter production and number of tillers which might result in the highest number of effective tillers per m^2 (Madhavilatha et al., 2020). In case of number of grains per ear head and weight of grains per ear head, the highest values were registered in the cultivar Bharathi. Further, it was on par with Hima and Indravati in the expression of maximum number of grains per ear head and remained statistically at par with Vegavathi, Suvarnamukhi and Indravathi in terms of the weight of grains per ear head. The inferior values of number of grains per ear head and weight of grains per ear head were counted with the cultivars VL Mandua 352 and Vegavathi, respectively. Except the above-mentioned cultivars, the remaining varieties, namely, Sri Chaitanya and Hima performed marginally well in expression of number of grains per ear head and weight of grains per ear head in the study. The superior performance of Bharathi might be due to the genetic potential of the cultivar in expression of the above-mentioned yield attributes of finger millet (Teklu et al., 2020; Sendhivel and Veeramani, 2020; Sharmila et al., 2023; Anand et al., 2024).

The number of grains per ear head and 1000 grain weight Indravathi remained on par with Bharathi and significantly superior to all other finger millet cultivars (Table 5). However, Swarnamukhi and VL Mandua 352 cultivars reported the lowest values of grains per ear head and 1000 grain weight, respectively. Further, in expression of maximum weight of grains per hill the cultivar Indravathi showed its significant superiority over other finger millet cultivars studied. Though the cultivar Indravathi expressed its superiority in the length of fingers, it remained on par with all other finger millet cultivars except Suvarnamukhi and VL Mandua 352 (Figure 2). The superior performance of the cultivar Indravati could be due to the significant performance in expression of growth attributes such as dry matter, leaf area index and number of tillers, which might further result in better yield attributing characters during later stages of the crop growth. The results are in the pipeline with the previous findings of Goswami et al. (2015), Wafula et al. (2016), Radha et al. (2019) and Madhavilatha et al. (2020).

Crop phenology and yield

The phenology and yields of finger millet cultivars were strongly influenced among themselves (Table 6). In case of phenophases, the days to 50% flowering varied between 53 DAT to 78 DAT and days to maturity ranged between 78 DAT and 116 DAT. Further, the cultivar Bharathi recorded the early 50% flowering and early maturity at 53 DAT and 78 DAT, respectively. This variety was closely followed by Sri Chaitanya with 55 DAT and 79 DAT for 50% flowering and maturity

Figure 2. Finger length of cultivars studied.

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respectively. Moreover, the variety Hima took prolonged vegetative growth period and showed 50% flowering at 78 DAT followed by maturity at 116 DAT. The difference in days to flowering and days to maturity among the cultivars might be due to the genotypic characters, growing degree days and their adaptability to agroclimatic conditions (Gohain and Reddy, 2020; Nanja Reddy et al., 2021).

Among the finger millet cultivars, the highest grain yield (2315 kg ha^{-1}), stover yield (5372 kg ha^{-1}) and biological yield (7687 kg ha^{-1}) were produced by Indravathi (Table 6). Further, in case of grain yield, Indravathi remained on par with Hima and Srichaitanya (Figure 3). The lowest grain yield production of 1527 kg ha^{-1} was recorded in the VL Mandua variety, followed by Suvarnamukhi (1743 kg ha^{-1}) and Champavathi (1802 kg

Table 5. Yield attributes of finger millet as influenced by different cultivars.

Cultivars	Number of effective tillers m^{-2}	Number of grains ear $head^{-1}$	Number of fingers ear $head^{-1}$	1000 grain weight (g)	Weight of grains Ear $head^{-1}$ (g)	Weight of grains $hill^{-1}$ (g)	Length of finger (cm)
VL Mandua 352	1.7	920	7.2	2.6	2.57	4.57	6.3
Hima (w) VR 936	2.1	1029	7.3	2.7	2.79	5.58	7.3
Indravathi VR1101	2.2	1022	8.4	2.8	2.82	6.72	7.7
Vegavathi VR 929	2.0	920	7.3	2.8	2.54	5.42	7.0
Champavathi VR 708	1.8	983	7.2	2.6	2.80	5.34	7.1
Suvarnamukhi VR 988	1.9	945	7.0	2.7	2.56	4.56	6.8
Bharathi VR 762	1.8	1097	7.7	2.8	3.10	5.74	7.3
SriChaitanya VR 847	2.3	979	7.4	2.7	2.66	5.60	7.4
S.Em. (±)	0.1	35.1	0.2	0.1	0.2	0.2	0.2
C.D. (P= 0.05)	0.2	106.6	0.7	0.3	0.5	0.6	0.7
C.V. (%)	7.1	6.2	5.6	7.2	5.3	6.2	5.4

Figure 3. Grains of the best-performed cultivars of finger millet.

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ha^{-1}). Indravathi remained statistically at par with Sri Chaitanya, Hima, Bharathi, and Champavathi in terms of stover yield and biological yield. Moreover, similar to grain yield, VL Mandua 352 registered the lowest stover yield (4584 kg ha^{-1}) and biological yield (6327 kg ha^{-1}) of finger millet. The superior performance of Indravathi could be due to its higher yield potential related to the genetic makeup as well as a better performance of growth characters and yield attributes contributing to higher grain and stover yield of the cultivar (Anuradha and Patro, 2019; Das et al., 2022; Prabhakar et al., 2023).

Similar to yield, the maximum harvest index was also computed with Indravathi, and this cultivar remained on par with all other cultivars in the experiment except VL Mandua 352. Since most of the cultivars considered for the experiment are improved genotypes and they have equal potential for distribution of photosynthates between vegetative and reproductive parts of the crop, resulting in the least difference in harvest index (Radha et al., 2019; Panda et al., 2021; Prabhakar et al., 2023).

Vegavathi. Further, the highest zinc (2.58 mg 100 g^{-1}) and copper (0.74 mg 100 g^{-1}) were observed with Indravathi. The trend of grain yield and nutrient content found an indirect relation where the variety with less yield potential (VL Mandua 352) produced higher quality grains with high crude protein and other essential element concentrations. Also, the change in grain nutrient concentration of finger millet cultivars can be due to the genetic makeup of the genotypes studied. The findings corroborate with the earlier research of Shibairo et al. (2014), Wamalwa et al. (2019), Mundphane et al. (2019) and Teklu et al. (2024).

Regression analysis

The regression analysis of yield attributes of finger millet with grain yield showed a weak to strong correlation with respect to different yield-attributing characters (Figures 4, 5 and 6). The parameters, viz., effective tillers per m^2, grain weight per hill and length of finger, showed a strong coefficient of determination with R^2 values of 0.73, 0.75 and 0.90, respectively. This analysis described the importance of the above-mentioned yield attributing characters and their contribution to grain yield enhancement. Further, the other yield attributing characters, namely, number of grains per ear head, fingers per ear head and weight of grains per ear head showed a weak correlation with R^2 values of 0.35, 0.49 and 0.19, respectively. This showed the least effect of these yield attributes on the grain yield of finger millet (Nagaraja et al., 2017; Anand et al., 2024).

Table 6. Phenology and yield of finger millet as influenced by different varieties.

Cultivars	Days to 50% flowering	Days to maturity	Grain yield (kg ha^{-1})	Stover yield (kg ha^{-1})	Biological yield (kg ha^{-1})	Harvest index (%)
VL Mandua 352	61DAT	94 DAT	1527	4219	5746	26.58
Hima (w) VR 936	78 DAT	116 DAT	2107	5142	7249	29.07
Indravathi VR1101	55 DAT	80 DAT	2315	5372	7687	30.12
Vegavathi VR 929	57 DAT	80 DAT	1819	4964	6783	26.82
Champavathi VR 708	63 DAT	92 DAT	1802	4853	6655	27.08
Suvarnamukhi VR 988	72 DAT	106 DAT	1743	4584	6327	27.55
Bharathi VR 762	53 DAT	78 DAT	1983	5027	7010	28.29
Sri Chaitanya VR 847	55 DAT	79 DAT	2217	5279	7496	29.58
S.Em. (±)	NA	NA	90.2	216.8	244.6	1.1
C.D. (P= 0.05)			273.6	657.7	741.7	3.3
C.V. (%)			8.1	7.6	6.2	6.7

* NA= not analysed

Grain nutrient content

The nutrient content of finger millet grain varied marginally among cultivars (Table 7). The analysed data revealed that the highest nitrogen (1.27%), potassium (0.42%), calcium (276 mg 100 g^{-1}), magnesium (184 mg 100 g^{-1}), carbohydrates (76.6 mg g^{-1}) and protein content (7.8%) were recorded in the variety VL Mandua 352. However, the maximum phosphorous (0.28%) and iron content (3.22 mg 100 g^{-1}) was noted with the cultivar

Table 7. Grain nutrient content of finger millet as influenced by cultivars

Cultivars	Nutrient analysis									
	N (%)	Crude protein (%)	P (%)	K (%)	Ca (mg 100 g^{-1})	Zn (mg 100 g^{-1})	Fe (mg 100 g^{-1})	Mg (mg 100 g^{-1})	Cu (mg 100 g^{-1})	Carbohy-drate (mg g^{-1})
VL Mandua 352	1.27	7.8	0.26	0.42	276	2.46	2.94	184	0.67	74.6
Hima (w) VR 936	1.15	7.25	0.24	0.36	253	2.40	2.85	181	0.60	69.4
Indravathi VR1101	1.21	7.63	0.23	0.38	254	2.58	2.92	168	0.74	73.1
Vegavathi VR 929	1.24	7.73	0.28	0.40	268	2.44	3.22	162	0.62	68.7
Champavathi VR 708	1.19	7.51	0.21	0.37	271	2.54	3.02	176	0.74	73.5
Suvarnamuki VR 988	1.24	7.72	0.26	0.41	262	2.38	3.17	172	0.72	70.1
Bharathi VR 762	1.16	7.19	0.21	0.37	250	2.51	2.92	161	0.71	71.8
Sri Chaitanya VR 847	1.20	7.41	0.22	0.41	267	2.35	3.06	166	0.60	70.3

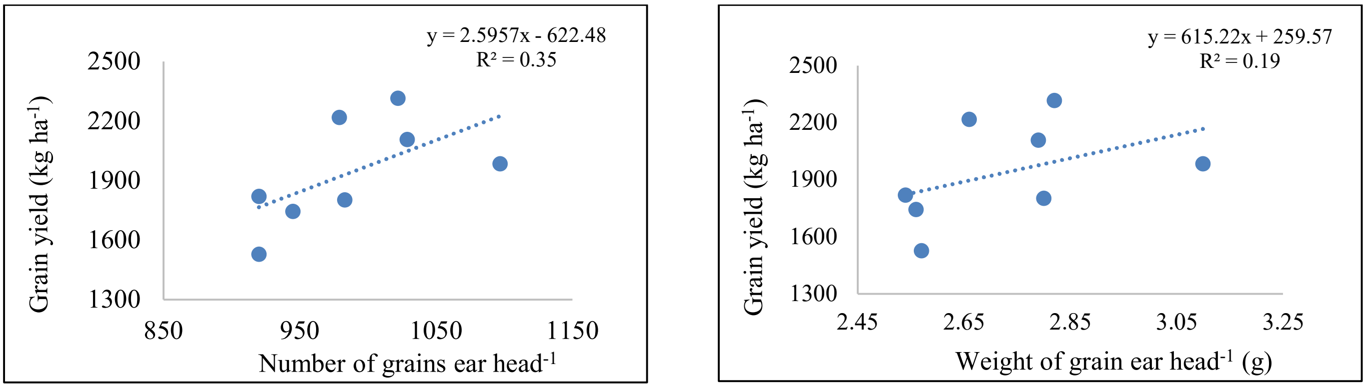

Figure 4. Regression analysis of effective tillers m^{-2} and number of grains ear head^{-1} with grain yield of finger millet cultivars.

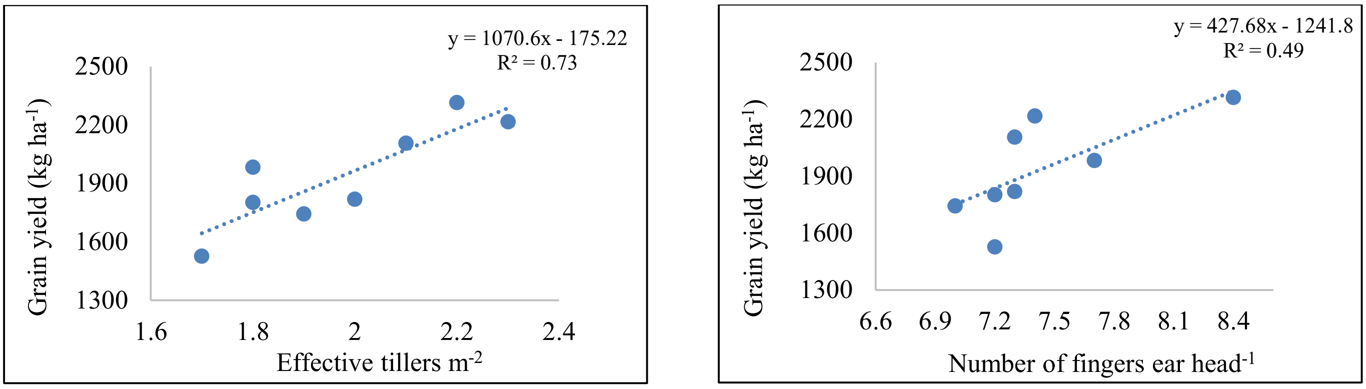

Figure 5. Regression analysis of weight of grains earhead^{-1} and number of fingers ear head^{-1} with grain yield of finger millet cultivars.

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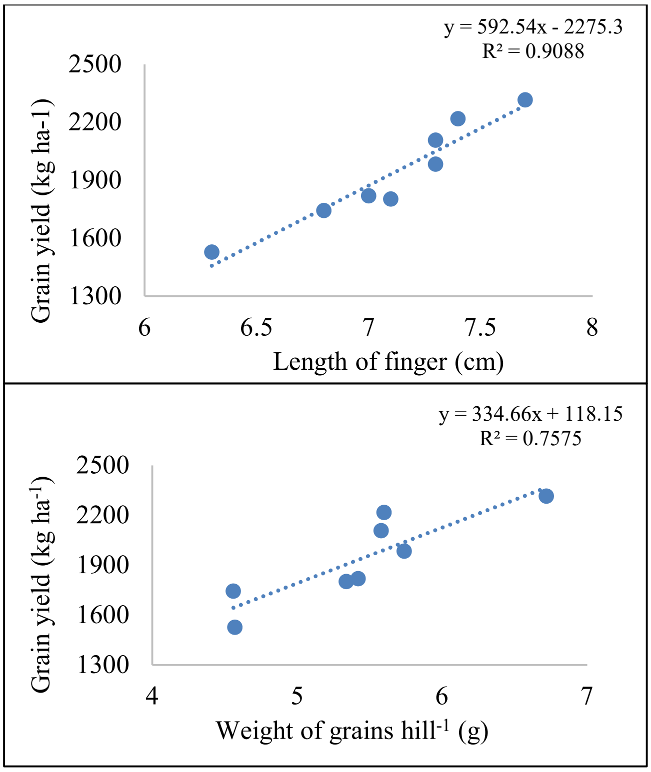

Figure 6. Regression analysis of the weight of grains hill^{-1} and length of fingers with grain yield of finger millet cultivars.

The study clearly revealed that the choice of suitable cultivar could boost the productivity of finger millet which is required for strengthening the economics of crop cultivation in the hot and sub-humid region of Odisha as well as the wellbeing of farmers of the region.

Conclusion

In the present study, finger millet cultivars differed in their growth and productivity expression under the study area. Based on the significant characteristics related to agronomic traits as well as the productivity of finger millet, Indravathi, Sri Chaitanya and Hima showed superiority. From the study, it may be concluded that cultivation of Indravathi and Sri Chaitanya can be considered for short duration and Hima as long duration crop for obtaining higher yield and good quality grains during *Kharif* season under hot and subhumid region of Odisha. Further, the study opens a window of future scope of research on some more cultivars, their suitability in the region and improved agronomic management practices.

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Conflict of interest

All authors declare that there is no conflict of interest.

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