

**Evaluation of Antioxidant Potency of Indian Finger Millet (*Eleusine coracana*) and Pearl Millet (*Pennisetum glaucum*) Cultivars Using DPPH and FRAP Assays**  
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**Abstract:**

The availability of high polyphenolic content in millets makes this recognized as a nutritionally rich cereal with significant antioxidant potential. The present study evaluated the antioxidant potency of aqueous extracts of ten cultivars each of Indian Finger Millet (*Eleusine coracana*) and Pearl Millet (*Pennisetum glaucum*) using DPPH radical scavenging and Ferric Reducing Antioxidant Power (FRAP) assays. Finger millet cultivars exhibited DPPH activity ranging from 22.57 - 26.48% and FRAP values from 18.40 - 26.93%. Pearl millet cultivars demonstrated higher antioxidant activity with DPPH ranging from 27.13 - 31.84% and FRAP from 27.78 - 39.46%. Mean antioxidant values revealed significantly greater radical scavenging and reducing power in pearl millet compared to finger millet. These results highlight cultivar-specific variability and confirm the superior antioxidant potential of pearl millet aqueous extracts. The findings support the incorporation of millets in functional foods for health promotion.

**Introduction**

Oxidative stress, caused by excessive free radical generation, contributes to the development of chronic diseases including cardiovascular disorders, cancer, diabetes, and neurodegenerative conditions (Halliwell and Gutteridge, 2015). Dietary antioxidants play a crucial role in neutralizing free radicals and protecting cellular components from oxidative damage.

Millets are traditional cereal crops widely consumed in India and Africa, valued for their nutritional richness and bioactive compounds. Finger millet is known for high phenolic content, dietary fiber, minerals, and antioxidant capacity (Devi *et al.*, 2014). Pearl millet is equally significant due to its high levels of flavonoids, phenolic acids, and micronutrients contributing to enhanced antioxidant properties (Amadou *et al.*, 2013).

Several studies have demonstrated that millet phenolics exhibit strong radical scavenging and metal-chelating activities (Chandrasekara and Shahidi, 2011). However, antioxidant activity varies considerably among cultivars and species depending on genetic makeup and growing conditions.

The present investigation aimed to evaluate and compare the antioxidant potency of aqueous extracts of different cultivars of finger millet and pearl millet using DPPH and FRAP assays, providing insight into their functional food potential.

### **Materials and Methods:**

#### **Sample Collection:**

Ten cultivars each of Indian finger millet and pearl millet were procured from local agricultural research stations and farmers' fields. Grains were cleaned, dried, powdered, and stored in airtight containers.

#### **Preparation of Aqueous Extract:**

Powdered millet samples (10 g) were extracted with 100 mL distilled water at 60°C for 2 hours with continuous stirring. The extracts were filtered and centrifuged at 5000 rpm for 10 minutes. Supernatants were stored at 4°C until analysis (Singleton *et al.*, 1999).

#### **DPPH Radical Scavenging Assay:**

Antioxidant activity was determined using the DPPH method described by Brand-Williams *et al.* (1995). Briefly, 0.1 mM DPPH solution was mixed with millet extract and incubated in the dark for 30 minutes. Absorbance was measured at 517 nm. Percentage inhibition was calculated:

$$\% \text{ Inhibition} = ((A_0 - A_1)/A_0) \times 100$$

Where,  $A_0$  = control absorbance and  $A_1$  = sample absorbance.

#### **FRAP Assay:**

Ferric reducing antioxidant power was measured according to Benzie and Strain (1996). The FRAP reagent was mixed with sample extract and incubated at 37°C for 30 minutes. Absorbance was read at 593 nm. Results were expressed as percentage reducing activity.

### Statistical Analysis:

All assays were performed in triplicate. Results were expressed as mean  $\pm$  standard deviation.

### Results:

The antioxidant potency of aqueous extracts from ten cultivars each of Indian finger millet and pearl millet was evaluated using DPPH radical scavenging and FRAP assays. The results demonstrated clear cultivar-specific variation as well as species-level differences in antioxidant activity as following:

#### Finger Millet:

Evaluation of antioxidant Potency of Finger Millet Cultivars is presented in table 1.

**Table 1.** Antioxidant Potency of Finger Millet Cultivars

Cultivar	DPPH (%)	FRAP (%)
GPU 28	24.71 $\pm$ 0.52	22.44 $\pm$ 1.91
GPU 48	23.59 $\pm$ 0.60	19.07 $\pm$ 1.46
HR 911	24.25 $\pm$ 0.06	20.42 $\pm$ 0.11
PRM 1	22.57 $\pm$ 1.62	18.40 $\pm$ 2.13
Local (BH)	23.38 $\pm$ 0.81	22.22 $\pm$ 1.69
Indaf-9	25.69 $\pm$ 1.50	22.89 $\pm$ 2.36
RAU-8	26.48 $\pm$ 2.29	26.03 $\pm$ 5.50
PR-202	24.48 $\pm$ 0.29	26.93 $\pm$ 6.40
VL-315	25.44 $\pm$ 1.25	22.22 $\pm$ 1.69
GPU-66	22.57 $\pm$ 1.62	25.13 $\pm$ 4.60

The DPPH radical scavenging activity among finger millet cultivars ranged from 22.57  $\pm$  1.62% to 26.48  $\pm$  2.29%. The highest activity was observed in cultivar RAU-8 (26.48  $\pm$  2.29%), followed by Indaf-9 (25.69  $\pm$  1.50%) and VL-315 (25.44  $\pm$  1.25%), indicating relatively stronger free radical quenching capacity. The lowest DPPH activity was recorded in PRM 1 and GPU-66 (22.57  $\pm$  1.62%).

FRAP values for finger millet ranged between 18.40  $\pm$  2.13% and 26.93  $\pm$  6.40%. The highest reducing power was found in PR-202 (26.93  $\pm$  6.40%) and RAU-8 (26.03  $\pm$  5.50%),

whereas PRM 1 ( $18.40 \pm 2.13\%$ ) showed the lowest activity. Overall, finger millet cultivars exhibited moderate antioxidant capacity with noticeable variability.

### Pearl Millet:

Evaluation of antioxidant Potency of Finger Millet Cultivars is presented in table 2.

**Table 2.** Antioxidant Potency of Pearl Millet Cultivars

Cultivar	DPPH (%)	FRAP (%)
MPMH 21	$29.71 \pm 0.12$	$31.57 \pm 0.00$
Giant Bajra	$28.36 \pm 1.23$	$27.78 \pm 3.79$
FMH-3	$29.16 \pm 0.43$	$30.94 \pm 0.63$
Local (BH)	$27.13 \pm 2.46$	$28.73 \pm 2.84$
Local (MP)	$28.11 \pm 1.48$	$31.89 \pm 0.32$
ICMH-356	$30.89 \pm 1.30$	$33.46 \pm 1.89$
Pioneer 86M86	$31.84 \pm 2.25$	$39.46 \pm 7.89$
MP-7792	$29.43 \pm 0.16$	$29.04 \pm 2.53$
MP-7872	$30.59 \pm 1.32$	$29.99 \pm 1.58$
Raj-171	$27.13 \pm 2.46$	$35.99 \pm 4.42$

Pearl millet cultivars exhibited higher antioxidant activity than finger millet across both assays. The DPPH radical scavenging activity ranged from  $27.13 \pm 2.46\%$  to  $31.84 \pm 2.25\%$ . The highest DPPH activity was observed in Pioneer 86M86 ( $31.84 \pm 2.25\%$ ), followed by ICMH-356 ( $30.89 \pm 1.30\%$ ) and MP-7872 ( $30.59 \pm 1.32\%$ ). Lower but still substantial activity was recorded in Local (BH) ( $27.13 \pm 2.46\%$ ).

FRAP values in pearl millet ranged from  $27.78 \pm 3.79\%$  to  $39.46 \pm 7.89\%$ , indicating strong reducing power. The highest FRAP activity was observed in Pioneer 86M86 ( $39.46 \pm 7.89\%$ ), followed by Raj-171 ( $35.99 \pm 4.42\%$ ) and ICMH-356 ( $33.46 \pm 1.89\%$ ). These results reflect both higher antioxidant potency and wider variability among pearl millet cultivars.

### Comparative Analysis:

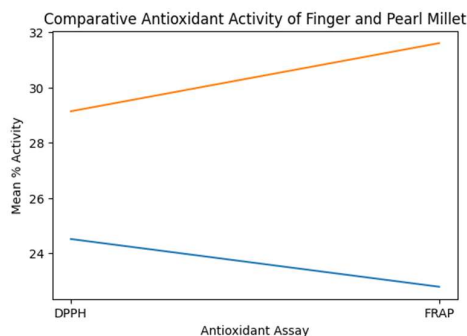
Comparative evaluation of antioxidant Potency of Finger Millet Cultivars is presented in table 3.

**Table 3.** Comparative antioxidant Potency of Pearl Millet Cultivars

Parameter	Finger Millet	Pearl Millet
DPPH (%)	24.51 ± 1.14	29.14 ± 1.56
FRAP (%)	22.78 ± 2.91	31.61 ± 3.68

The mean antioxidant activity clearly demonstrated the superiority of pearl millet over finger millet. The average DPPH activity was 24.51 ± 1.14% for finger millet and 29.14 ± 1.56% for pearl millet, while mean FRAP values were 22.78 ± 2.91% and 31.61 ± 3.68%, respectively. Graph 1 illustrates higher antioxidant potential of pearl millet compared to finger millet in both assays.

**Graph 1.** Comparative antioxidant Potency of Pearl Millet Cultivars



Range analysis further supported these findings. Finger millet showed narrower and lower ranges for both DPPH (22.57 - 26.48%) and FRAP (18.40 - 26.93%), whereas pearl millet exhibited higher and broader ranges for DPPH (27.13–31.84%) and FRAP (27.78–39.46%).

### Discussion:

The results demonstrate that both millet species possess appreciable antioxidant activity, with pearl millet exhibiting superior radical scavenging and reducing power. This may be attributed to its higher concentration of phenolic acids and flavonoids (Amadou *et al.*, 2013).

Finger millet showed moderate antioxidant activity, consistent with earlier studies reporting high tannin and polyphenol content contributing to free radical scavenging (Devi *et al.*, 2014). Cultivar RAU-8 and PR-202 exhibited comparatively higher FRAP values, indicating enhanced electron-donating capacity. The broader range of FRAP activity observed in pearl millet (27.78 - 39.46%) suggests higher variability and greater antioxidant richness among cultivars, as also reported by Chandrasekara and Shahidi (2011). The higher mean antioxidant values of pearl millet suggest its potential as a superior functional cereal for combating oxidative stress-related diseases.

### **Conclusions:**

The present study confirms that both Indian finger millet and pearl millet possess significant antioxidant potential. However, pearl millet cultivars exhibited markedly higher DPPH radical scavenging and FRAP reducing activities than finger millet. Cultivar-specific differences were evident, highlighting the importance of varietal selection for nutritional enhancement. These findings support the promotion of pearl millet as a functional food ingredient with enhanced health benefits.

### **Further Suggestions:**

Identification and quantification of individual phenolic compounds using HPLC or LC-MS. Evaluation of antioxidant activity in vivo models. Assessment of processing effects (malting, fermentation, cooking) on antioxidant potency. Development of antioxidant-rich millet-based functional foods.

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NA

### **Authors' contributions:**

Sole Authership

### **Data availability statement:**

NA

### **Disclosure statement:**

NA

### **Ethical approval:**

NA

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