EVALUATION OF HYDROPONIC MILLET FODDER PRODUCTION POTENTIAL OF SOME PEARL MILLET VARIETIES IN SEMI-ARID ENVIRONMENT OF NIGERIA

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Abstract
The field experiment was experiment conducted on evaluation of pearl millet varieties for hydroponic green fodder potential in a semi-arid environment of Nigeria to determine the effects of variety on agronomic characteristics of hydroponic millet fodder. The experiment was carried out at Lake Chad Research Institute which was laid out in a Completely Randomized Design (CRD). Four (4) varieties of pearl millet were used for this experiment designed as V_1, V_2, V_3 and V_4 as treatment, each treatment was replicated three times. The study reveals that the highest plant height, fresh fodder weight and dry fodder weight (6.88 cm), (6.10kg) and (1.41kg) was significantly ($P<0.05$) recorded in Super Sosat hydroponic millet fodder while the lowest (6.60 cm), (65 cm), (5.45kg) and (1.27kg) was observed in Sosat C88, Jirani, Maiwa and Maiwa pearl millet varieties. In conclusion, the best millet variety for hydroponic fodder production was Super Sosat based on the agronomic characteristics of the fodders observed and alternatively Jirani millet variety.

Keywords: Millet variety, hydroponic, green fodder

DESCRIPTION OF PROBLEM

Hydroponic fodder production involves growing fodder in water for up to 8 days without soil, providing favorable conditions for seed development and growth (1). This technique allows plants to meet necessary growth conditions without soil and direct sunlight, allowing nutrients stored in seeds to be directly utilized for *plumule* development (2). Hydroponic fodder production is an efficient and effective method for producing green fodder for livestock, controlling climatic conditions and plant nutrition (6). This technique offers increased production and stable harvests of high-quality fresh feeds, available year-round and on an industrial scale. The fodders are produced under organic conditions, free from synthetic materials (3). Most hydroponic fodder research primarily focused on common cereal grains like barley, maize and sorghum, neglecting other crops like millet, which is a stable food crop that can be used for hydroponic green fodder production with lower water usage. It produces 888.0 g of green fodder yield from 300.0 g of millet seed during the dry season (4). Hence, there is need for this research work.

MATERIALS AND METHODS

Experimental site: The field experiment was carried out at Lake Chad Research Institute, Livestock experimental farm, Maiduguri, Borno State.

Source of seed

The seed of four (4) varieties of millet were obtained at Cereals Crop Research Department, Seed Production Unit, Lake Chad Research Institute (LCRI), Maiduguri, Borno State.

Treatment and Experimental Design: The hydroponic millet fodder production experiment was laid out in Completely Randomized Design. Four (4) varieties of pearl millet V_1, V_2, V_3 and V_4 (Sosat C88, Super SOSAT, Jirani and Maiwa) were used as treatments and replicated thrice which gives a total of twelve (12) treatment.

Hydroponic fodder production and management: The fodder was produced in a screen house (3 x 4 m) using aluminum tray (80 x 30 x 6 cm). The seed was sterilized by soak in water for 2 hours using tap water containing 2% hypo chloride, rinse and re-soaked with clean water for 7-8 hours and planted at the rate of 800 g per 80 x 30 x 6 cm tray at 2 cm deep. Irrigation was done every four hours and the fodder was harvested at 10 days after sowing.

Analytical Technique: The data collected were analyzed using analysis of variance (ANOVA). The differences among the means were compared

using Least Significant Difference (LSD) at 5% level of probability.

Result and Discussion

Effects of variety on growth component at 8, 9 and 10 DAYS

Effects of variety on Plant height

Table 1 shows significant differences in plant height among hydroponically grown millet fodder varieties. Sosat C88 and Super Sosat varieties had the tallest plants (6.56 cm and 6.60 cm) and (6.12 cm and 6.88 cm) at 8 and 9 days respectively, while Maiwa was the shortest (5.47 cm and 6.18 cm). Super Sosat was the tallest at 10 days

This work is similar with previous studies indicating hydroponic millet fodder can reach various heights at different days, and hydroponic pearl millet fodder can reach 8 cm tall at 8 days (5). The results of this study is also disagree with the work of (8) who reported that hydroponic millet fodder reached about 8.5 cm tall at 8 days after sowing. This differences could be due to regional, varietal and climatic difference.

Table 1: Effects of variety on plant height of hydroponically grown millet fodders at 8, 9 and 10 DAYS

	Plant Height (cm)		
Varieties(V)	**8 DAYS**	**9 DAYS**	**10 DAYS**
Sosat C88	6.42^{a}	6.56^{a}	6.60^{ab}
Super Sosat	5.87^{b}	6.12^{ab}	6.88^{a}
Jirani	5.57^{c}	5.87^{bc}	6.79^{a}
Maiwa	5.42^{c}	5.47^{c}	6.18^{b}
LSD (0.05)	0.15	0.46	0.48

Means followed by the same letter(s) in the same column are statistically similar using Least Significant Difference (LSD) at 5% level of probability.

Effects of variety on number of leaves

Table 2 shows the impact of variety on hydroponic millet fodder leaf number at different growing intervals. Super Sosat, Jirani, and Sosat C88 had the highest leaf number (2.05), (2.03) and (2.00) respectively at 10 DAS, while Maiwa had the least (1.95) leaf number at 10 DAS. Higher leaf number obtained in the three varieties may be due to increased photosynthetic activities. The results obtained in respect of number of leaves in this study is agree with the results of (4) who reported average number of leaves 2 per plant

Table 2: Effects of variety on number of leaves of different hydroponically grown millet fodders at 8, 9 and 10 DAYS

	Number of Leaves		
Varieties	**8 DAYS**	**9 DAYS**	**10 DAYS**
Sosat C88	1.95^{a}	1.95^{b}	2.00^{a}
Super Sosat	1.98^{a}	2.03^{a}	2.05^{a}
Jirani	1.97^{a}	1.98^{ab}	2.03^{a}
Maiwa	1.92^{a}	1.94^{b}	1.95^{b}
LSD (0.05)	0.122^{NS}	0.089	0.11

Means followed by the same letter(s) in the same column are statistically similar using least significant difference (LSD) at 5% level of probability.

Effects of variety on fresh weight

Table 6 presents the results of a study on the effect of variety on the fresh weight of hydroponically grown millet fodder at three growing intervals. Super Sosat recorded the heaviest fresh fodder weight (6.10 kg), while Jirani and Sosat C88 and Maiwa had similar weights (6.04 kg), (5.45 kg) and (5.58 kg) respectively.

The study found that fodder yield increases with growing period and agreed with findings of (7) Kodo and Little millet varieties yielding 5.9kg each from 1kg of millet seed. Fresh weight obtained in this study also disagreed, with previously reported work (5) that 1kg cereal seed producing approximately 7kg of hydroponic green fodder. This work also agree with the work of (9) who reported that hydroponic millet produced about producing 6-10 kg fresh green sprouts from 1 kg of millet seed. The similarity observed could be due to similarity among the varieties used.

Table 3: Effects of variety on fresh fodder yield of hydroponically grown millet fodders at 8, 9 and 10 DAYS

	Fresh weight (kg)		
Variety	**8 DAYS**	**9 DAYS**	**10 DAYS**
Sosat C88	6.08^{a}	6.09^{a}	6.10^{a}
Super Sosat	5.44^{b}	5.45^{b}	5.45^{b}
Jirani	6.00^{a}	6.02^{a}	6.04^{a}
Maiwa	5.52^{b}	5.53^{b}	5.58^{b}
LSD (0.05)	0.44	0.44	0.45

Means followed by the same letter(s) in the same column are statistically similar using least significant difference (LSD) at 5% level of probability.

Effects of variety on fodder dry weight

Table 7 presents the varietal effect on dry weight of hydroponically grown millet fodder at three growing intervals. Super Sosat recorded the heaviest (1.41 kg) dry fodder, while Maiwa, Jirani, and Sosat C88 had similar (1.27 kg), (1.22 kg) and (1.18 kg) respectively dry fodder weights .

This study confirms the scientific prediction of dry weight from fresh green fodder weight, with yields ranging from 6 to 10 times the harvested weight. Hydroponic millet fodder produced 163.0 g dry weight from 888.0 g, possibly due to decreased carbohydrates (4).

Table 4: Effects of variety on dry weight of hydroponically grown millet fodders

Variety	Dry weight (kg) at 10 DAYS
Sosat C88	1.18[b]
Super Sosat	1.41[a]
Jirani	1.22[b]
Maiwa	1.27[b]
LSD (0.05)	0.12

Means followed by the same letter(s) in the same column are statistically similar using least significant difference (LSD) at 5% level of probability

Conclusion and Application

In conclusion, based the study carried out, the result obtained reveals that Super Sosat pearl millet variety could be used for producing hydroponic green fodder as it grows best and produced better biomass yield than the all-other varieties. Jirani pearl millet variety however is considered to be the best alternative that can be used for hydroponic green fodder production.

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