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Effect of nutrient management and PPFM application on growth and productivity of barnyard millet under rain-fed ecosystem

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Abstract
An experiment was conducted during *Rabi* 2018 at Agricultural Research station, Paramakudi in Ramanathapuram (Dt). The objective of experiment was to find out the suitable fertilizer level along with drought mitigation measures to increase the yield of Barnyard millet under rain-fed condition. Growth character of Barnyard millet is expressed in terms of plant height and the yield characters are expressed in terms of number of productive tillers, length of panicle, test weight, grain and straw yield. Split application of 150 % of RDF 99:49.5:30 NPK kg ha^{-1} (NK: 25% Basal, 75% in equal split at tillering & flowering) along with PPFM application synergistically increased the grain and straw yield of barnyard millet under rain-fed ecosystem. Application of PPFM is helpful in mitigating drought stress during crop growth period.

Keywords: Nutrient management, split application, PPFM, rain-fed ecosystem, barnyard millet

Introduction
Millets are predominant dry land crops. Barnyard millet is usually cultivated in an area were climatic and edaphic condition are unsuitable for rice cultivation (Sood *et al.*, 2015) [1]. Among all the millets barnyard millet is hardy and vigorous growing nature, which can be grown in drought and waterlogging condition. Millets are quick growing and short duration cereals can withstand adverse condition (Raundal *et al.*, 2017) [2]. Barnyard millet is highly nutritious. Good whiteness retention after milling and also has high milling percentage (70 %). Besides their nutritional value it has its own disadvantage of lower productivity (683 kg ha^{-1}), contribution of millets in total food production of India reduced from 22.17% to 6.94% over the last six decades (Malathi *et al.*, 2015) [3]. Hence there is a scope to increase the productivity of barnyard millet under rain-fed condition with proper nutrient management and drought mitigation measures.

Materials and methods
The field experiment was conducted at Agricultural Research Station, Paramakudi during *Rabi* 2018. The beds were formed with a dimension of 5.0 m x 4.0 m and the plots were properly levelled to have uniform surface area. The field experiment was laid out in a Randomized block design with 12 treatment combination, replicated thrice and with net plot size of 4 m × 3.6 m. Pre- monsoon line sowing was taken on 05-09-2018 with the spacing of 25×10 cm. First soaking rain of 29 mm received on 15-09-2018. The recommended nutrients were applied through Urea, SSP and MOP. Phosphorous is applied as basal for all the treatments, N & K were applied to the crop as per the treatment schedule. Total amount of rainfall received during the cropping period was 374 mm received in 17 rainy days. PPFM application (1% spray solution) was given using high volume sprayer on 30 and at 50 days after receipt of soaking rain.
In each treatment, five plants were selected randomly for biometric observation. The observations on growth parameters, yield parameters and yield were recorded on 20 and 40 days after receipt of soaking rain and at harvest. The crop was harvested at 05-12-2018.

Treatment Details
T1- RDF (66:33:20 NPK kg ha^{-1}) as basal
T2- RDF (NK: 25% Basal, 25% Tillering & 50% Flowering)
T3- RDF (NK: 25% Basal, 75% in equal split at Tillering & Flowering)
T4- 150% RDF (99:49.5:30 NPK kg ha^{-1}) as basal
T5- 150% RDF (NK: 25% Basal, 25% Tillering & 50% Flowering)

T6- 150% RDF (NK: 25% Basal, 75% in equal split at Tillering & Flowering)
T7- RDF as basal + 1% PPFM**
T8- RDF (NK: 25% Basal, 25% Tillering & 50% Flowering) + 1% PPFM**
T9- RDF (NK: 25% Basal, 75% in equal split at Tillering & Flowering) + 1% PPFM**
T10- 150% RDF as basal + 1% PPFM**
T11- 150% RDF (NK: 25% Basal, 25% Tillering & 50% Flowering) + 1% PPFM**
T12- 150% RDF (NK: 25% Basal, 75% in equal split at Tillering & Flowering) + 1% PPFM**
*Entire dose of phosphorous applied as basal
**PPFM application at 30 and 50 days after receipt of soaking rain

Results and discussion

Growth parameters

Plant height was recorded at harvest, the highest plant height (143.2 cm) was recorded with T_{12} treatment compared to other treatment, which may be due to adequate availability of nutrient throughout the crop period as well as sufficient nutrient availability to the plants may lead to anatomical changes in plants such as increase in size of cells, intercellular spaces and thinner cell walls that leads to increased plant height, same result was noted by Raundal *et al.,* (2017) in rain-fed little millet. Triveni *et al.,* (2018) [4] and Sandhya Rani *et al.,* (2017) [5] in finger millet.

Yield parameters

At harvest 150 % RDF NK: 25% Basal, 75% in equal split at tillering & flowering with 1% PPFM (T_{12}) increased the number of tillers plant^{-1}. Basal application of RDF (T_1) recorded least number of tiller plant $^{-1}$. Same trend was observed with regard to panicle weight. Application of 150% of RDF NK: 25% Basal, 75% in equal split at tillering & flowering with 1% PPFM (T_{12}) recorded highest panicle weight (18.5 g panicle^{-1}) followed by the same treatment without PPFM application (T_6) This may be due to increased vegetative growth and capacity to produce more number of tillers under higher nitrogen levels. This result corroborates with the findings of Sathya *et al.,* (2009) [6].

Increased panicle length was observed with 150% of RDF NK: 25% Basal, 75% in equal split at tillering & flowering with 1% PPFM (T_{12}). Optimum quantity of N and K available at flowering stage of crop, may increase the photosynthetic assimilates as well as tolerance to pest and diseases and uniform availability of nutrient to the crop increases the panicle length of barnyard millet. This result was confirmed with the findings of Raundal *et al.,* (2017) in little millet.

Treatment with increased fertilizer application at critical stage of crop recorded increased test weight (T_{12}). Split application of nutrient to the plant makes the efficient use of available resource in rain-fed condition and also improves the source to sink relationship which ultimately shows the effect on test weight of crop. This result witnessed the result of Raundal *et al.,* (2017) in rain-fed little millet.

Grain and straw yield

Highest grain and straw yield was recorded with treatment (T_{12}) 1,568 kg ha^{-1} and 7,743 kg ha^{-1} followed by (T_6) 1526 kg ha^{-1} of grain yield and 6319 kg ha^{-1} of straw yield. Number of productive tillers, panicle length, panicle weight and test weight exerted a very strong positive correlation with grain yield of plant Rinkey Arya *et al.,* (2017) [7].

Effect of fertilizer levels and PPFM spray on growth and yield of Barnyard millet

Treatments	Plant height (cm)	Tillers plant^{-1}	Panicle length (cm)	Test weight (g)	Panicle weight (g panicle^{-1})	Grain yield kg ha^{-1}	Straw yield kg ha^{-1}
T_1: RDF	123.8	1.5	15.99	3.5	7.2	918	3611
T_2: RDF (25% Basal, 25% Tillering & 50% Flowering)	127.3	2.0	16.81	3.6	13.5	929	5277
T_3: RDF (25% Basal, NK in equal split at Tillering & Flowering)	128.4	2.2	17.21	3.7	11.1	944	3958
T_4: 150% RDF	132.8	2.2	17.8	3.8	14.4	1031	5625
T_5: 150% RDF (25% Basal, 25% Tillering & 50% Flowering)	136.1	2.8	18.58	4.0	14.6	1104	4201
T_6: 150% RDF (25% Basal, NK in equal split at Tillering & Flowering)	141.0	3.4	19.64	4.1	16.0	1526	6319
T_7: RDF + 1% PPFM	125.7	2.0	16.27	3.5	9.3	926	4757
T_8: RDF (25% Basal, 25% Tillering & 50% Flowering) + 1% PPFM	127.6	2.0	16.86	3.7	10.5	933	6631
T_9: RDF (25% Basal, NK in equal split at Tillering & Flowering) + 1% PPFM	128.8	2.2	17.32	3.8	11.5	995	5069
T_{10}: 150% RDF + 1% PPFM	135.1	2.6	17.93	4.0	12.1	1083	5173
T_{11}: 150% RDF (25% Basal, 25% Tillering & 50% Flowering) + 1% PPFM	139.8	3.0	19.07	3.9	15.6	1250	6875
T_{12}: 150% RDF (25% Basal, NK in equal split at Tillering & Flowering) + 1% PPFM	143.2	4.0	20.2	4.1	18.5	1568	7743
SEd	6.07	0.16	0.89	0.15	1.51	57.0	237.7
CD (0.05%)	12.603	0.343	1.860	0.328	3.138	118.30	493.12

Conclusion

Split Application of 150% of RDF (99:49.5:33) (NK: 25% Basal, 75% in equal split at tillering & flowering) + 1% PPFM application on 30 and at 50 days of the crop period increased the grain yield and straw yield of Barnyard millet under rain-fed ecosystem. Thus in turn resulted in higher return to the rain-fed farmer.

References

1. Salej Sood, Rajesh K, Khulbe Arun, Gupta K, Pawan K, Agarwal Hari *et al*. Barnyard millet-a potential food and feed crop of future, plant breeding. 2015; 134:135-137.
2. Raundal PU, Patil Vidya U. Response of little millet varieties to different levels of fertilizer under rainfed

condition. International advance research journal in science, engineering and technology, 2017, 4(8).
3. Malathi B, Chari Appaji, Rajendra Reddy, Dattari K, Sudhakar N. Growth pattern of millets in India, Indian J. Agric. Res. 2016; 50(4):382-386.
4. Triveni U, Sandhya rani Y, Patro TSSK, Anuradha N, Divya M. Fertilizer responsiveness of short duration improved finger milet genotypes to different levels of NPK fertilizers. Indian J Agric. Res. 2018; 52(1):97-100.
5. Sandhya rani Y, Triveni U, Patro TSSK, Divya M, Anuradha N. Revisiting of fertilizer doses in finger millet [*Eleusine coracana* (L.) Garten.] Throught targeted yield and soil test crop response (STCR) approach, Int. J. Curr. Microbial. App. Sci. 2017; 6(7):2211-2221
6. Sathiya k, Ramesh T. Effect of split application of nitrogen on growth and yield of aerobic rice, Asian J Exp. Sci. 2009; (23)1:303-306.
7. Rinkey Arya, Arun Bhatt, Vineet Kumar, Divya Prakash Singh. Correlation analysis of some growth, yield and quality parameters of barnyard millet (*Echionocloa frumentaceae* (Roxb.) Link) Germplasm, Journal of Pharmacognosy and Phytochemistry. 2017; 6(5):1426-1429.