

Effect of Humic and Fulvic Acid with Different Levels of NPK on Rice Yield**G. Venkateshprasath¹, M. Meyyappan^{1*}, M. Ganapathy² and A. Angayarkanni³**¹ Department of Agronomy, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamilnadu - 608 002² Department of Soil Science and Agricultural chemistry, Faculty of Agriculture, Annamalai University, Annamalai Nagar, Tamilnadu - 608 002Received: 5th April, 2017 Accepted: 15th May, 2017**Abstract**

Field experiment was conducted at Annamalai University Experimental Farm, Annamalai Nagar during Sornavari season (March to June, 2016) to study the effect of NPK at different levels along with soil and foliar application of organic substitutes on the growth and yield of rice. Among the treatments, application of 100 per cent NPK + FYM @ 12.5 t/ha + Isabion foliar application @ 1250 ml/ha on 20 and 50 DAT ranked first regarding number of productive tillers/m², filled grains/panicle, grain and straw yield.

Keywords: FYM, Humic acid, Fulvic acid, Yield parameters and yield**Abbreviations used**

USDA ; United States Department of Agriculture
ml ; millilitre
t ; Tonnes Kg ; Kilogram
ha ; Hectare DAT ; Days After Sowing
% ; Per cent @ ; at the rate of
FYM ; Farm Yard Manure Co₂ ; Carbon dioxide
ADT(R) ; Aduthura Rice
NPK ; Nitrogen, Phosphorus and Potassium

Introduction

According to USDA 2016-17 statistics, rice is grown in 114 countries across the world in an area of 161.35 million hectares with a production of 480.13 million metric tons and the productivity is 4.44 t/ha. In India, during 2016-17 rice is grown in an area of 433.88 lakh hectares with a production of 104.32 million tonnes and the productivity is 2.4 t/ha (Annual Report, 2016-17). Continuous use of inorganic fertilizers leads to deterioration of soil physical, chemical properties and biological activities in soil (Mahajan *et al.*, 2008). The only way out to this gloomy scenario is to develop sustainable and nutrient balance technological packages, which would increase the rice production without harming the precious environment. Improving soil fertility is severely constrained due to the decline of FYM from the livestock system. Hence, it is necessary to find out an alternative source for FYM. Humic acids are water soluble organic acids naturally present in soil organic matter, comprising a large family of organic compounds with similar characteristics that are products of organic matter transformations by soil micro-organisms. Humic acid improves soil aggregation,

aeration, permeability, water holding capacity, hormonal activity, microbial growth, organic matter mineralization, solubilisation, availability of microelements and some macro elements. Fulvic acid provides a multitude of benefits like a powerful organic electrolyte, enhances cell division, elongation and root growth. Further, it increases the plant's oxygen uptake capacity with an associated increase in chlorophyll production, as a foliar spray and increase the permeability of plant membranes and uptake of nutrients. Application of amino acids led to decreased nitrate content and increased the total nitrogen content in plants.

Materials and Methods

A field experiment was conducted at Annamalai University Experimental Farm, Annamalai Nagar during Sornavari season (March to June, 2016) to study the effect of NPK at different levels along with soil and foliar application of organic substitutes on the growth and yield of rice variety, ADT(R)-45. The farm is situated at 110 24' North latitude, 79° 44' East longitude and at an altitude of 5.79 m above mean sea level. The texture is clayey loam with low in nitrogen, medium in phosphorus and high in potassium. The experiment was laid out in Randomized Block Design with three replications. There were twelve treatments *viz.*, T₁- 100% NPK + FYM @ 12.5 t/ha, T₂- 100% NPK + eM power (Humic acid and Fulvic acid) @ 12.5kg/ha on 7 and 35 DAT, T₃- 75% NPK + eM power @ 12.5kg/ha on 7 and 35 DAT, T₄- 50% NPK + eM power @ 12.5kg/ha on 7 and 35 DAT, T₅- 100% NPK + FYM @ 12.5 t/ha + Humic plus P foliar spray @ 625g/ha on 20 and 50 DAT, T₆- 100% NPK + eM power @ 12.5kg/ha on 7 and 35 DAT + Humic plus P foliar spray @ 625g/ha on 20 and 50 DAT, T₇- 75% NPK + eM power @ 12.5kg/ha on

7 and 35 DAT + Humic plus P foliar spray @ 625g/ha on 20 and 50 DAT, T₈- 50% NPK + eM power @ 12.5kg/ha on 7 and 35 DAT + Humic plus P foliar spray @ 625g/ha on 20 and 50 DAT, T₉- 100% NPK + FYM @ 12.5 t/ha + Isabion foliar spray @1250ml/ha on 20 and 50 DAT, T₁₀- 100% NPK + eM power @ 12.5kg/ha on 7 and 35 DAT + Isabion foliar spray @1250ml/ha on 20 and 50 DAT, T₁₁- 75% NPK + eM power @ 12.5kg/ha on 7 and 35 DAT + Isabion foliar spray @1250ml/ha on 20 and 50 DAT, T₁₂- 50% NPK + eM power @ 12.5kg/ha on 7 and 35 DAT + Isabion foliar spray @1250ml/ha on 20 and 50 DAT were tried. Based on the treatment schedule 100, 75 and 50 per cent of recommended dose of N, P and K were applied to the respective plots. Well decomposed farm yard manure @ 12.5 t /ha was applied to the respective plots as per treatment schedule. The organic granule, eM power is recommended @ 12.5 kg/ha and applied in two equal splits on 7 and 35 DAT to the respective plots as per treatment schedule. Humic plus P is an organic water soluble organic product containing 75 per cent potassium Humate, 15 per cent Fulvic acid and plant growth promoters. It is recommended @ 625 g/ha and sprayed on 20 and 50 DAT. Isabion contains organic fraction derived from amino acids, peptide mixture @ 62.5 per cent w/w as major compound. It is recommended @ 1250 ml/ha and sprayed on 20 and 50 DAT.

Results and Discussion

Among the treatments, the highest number of(511) productive tillers/m² and number of (106) filled grains/

panicle were observed in T₉- 100% NPK + FYM @ 12.5 t/ha + Isabion foliar spray application @1250 ml/ha on 20 and 50 DAT (Table -1). The increase in grain yield was recorded up to 450 and 180 kg/ha respectively due to foliar application of isabion or Humic plus P when compared to conventional method of 100 per cent NPK and FYM applications. Within the treatments, the highest grain yield of 5.88 t/ha was recorded in T₉- 100% NPK + FYM @ 12.5 t/ha + Isabion foliar spray application @1250 ml/ha on 20 and 50 DAT. The next in order was T₅-100% NPK + FYM @ 12.5 t/ha + Humic plus P foliar spray application @ 625g/ha on 20 and 50 DAT and T₁- 100% NPK + FYM application @ 12.5 t/ha. The reduction in grain yield due to reduced NPK application was improved further by Isabion or Humic plus P foliar spray @ 1250 ml/ha or 625ml/ha on 20 and 50 DAT. The same trend was noticed in terms of straw yield.

The combined beneficial effect of NPK and FYM in terms of improving the soil physical, chemical and biological properties, presence of hormones in FYM and availability of optimum quantity of nutrients at critical stages favourably influenced the growth parameters of the rice directly and yield parameters indirectly. Further, Humic acid foliar spray might have improved the chlorophyll content, increased the CO₂ assimilation in plants and increased the uptake of nutrients by plants. Among the two foliar sprays along with 100 per cent NPK plus 12.5 t FYM/ha, Isabion @ 1250 ml/ha was found to be better with more number of filled grains/panicle (20) when compared to conventional method of 100 per cent

Table 1. Yield and yield related attributes recorded in the different treatments

Treatments	Number of productive tillers/m ²	Number of filled grains/ panicle	Grain yield (t/ha)	Straw yield (t/ha)
	At harvest	At harvest		
T ₁	460	86	5.43	8.26
T ₂	410	73	4.78	7.22
T ₃	380	65	4.49	6.75
T ₄	246	43	3.25	4.95
T ₅	480	94	5.61	8.46
T ₆	419	81	5.18	7.82
T ₇	382	73	4.86	7.34
T ₈	251	48	3.46	5.23
T ₉	511	106	5.88	8.89
T ₁₀	421	92	5.24	7.92
T ₁₁	384	82	5.01	7.62
T ₁₂	262	52	3.62	5.48
SE _d	23.70	3.78	0.301	0.5529
CD(P=0.05)	49.91	7.82	0.623	1.1467



NPK and 12.5 t FYM application. This might be due to the increased uptake of more amount of nutrients and effective translocation of photosynthates from source to sink. This result is in line with the result of Vanitha and Mohandass (2014).

References

- Annual Report. 2016-17. Department of Agriculture, Cooperation & Farmers Welfare. p. 3. http://www.agricoop.nic.in/sites/default/files/Annual_rpt_201617_E.pdf
- Mahajan A, Bhagat RM. and Gupta RD. 2008. Integrated nutrient management in sustainable rice-wheat cropping system for food security in India. *SAARC Journal of Agriculture*. 6(2):29-32.
- Vanitha K and Mohandass N. 2014. Effect of humic acid on plant growth characters and grain of drip fertigated aerobic rice (*Oryza sativa* L.). *The Bioscan - An International Quarterly Journal of Life Sciences* 9(1):45-50.