Oral Session 2-1-6

Effect of Nutrient Management Options on Productivity and Nutritional Quality of Organically grown Basmati Rice under the Long-term Experiment (20 Years) of Basmati Rice-wheat Cropping System

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The world market for organically grown food is increasing at a very faster rate considering the ill effects of the excessive use of chemicals. Among many rice germplasm, *Basmati* is known to be the world's most precious rice strain (Shobha *et al.,* 2001). Farmers face diverse problems in rice production, especially the decline in factor productivity, erosion of mineral nutrients and soil organic carbon content, water-logging and soil salinization, and high level of nitrate concentration in well water (Prasad *et al.,* 2017). There is significant scope to expand the area of organic rice in India. Basmati rice is long-grain aromatic rice grown for many centuries in a specific geographical area, in the Himalayan foothills of the Indian sub-continent, blessed with characteristics of extra-long slender grains that elongate at least twice their original size with a characteristics soft and fluffy texture upon cooking, delicious taste, superior aroma, and distinct flavor. Basmati rice is unique among other aromatic long-grain rice varieties. The areas of *Basmati* rice production in India are the states of J&K, Himachal Pradesh, Punjab, Haryana, Delhi, Uttarakhand, and western Uttar Pradesh. India is the leading exporter of Basmati rice to the global market. India has exported 3.948 million tonnes of Basmati rice to the world for the worth of 3,540.4 million US$ during the year 2021-22. Major export destinations (2021-22) countries were Iran, Saudi Arabia, Iraq, UAE, USA & Yemen Republic, etc. (https://apeda.gov.in/apedawebsite/SubHead_Products/Basmati_Rice.htm). To increase production, *Basmati* rice needs a systematic approach, especially in respect of nutrient management. Therefore, a study was conducted on long-term (20 years) to increase the productivity of *Basmati* rice through organic nutrient management options.

A field experiment on *Basmati* rice with organic nutrient management options was initiated in 2003. The present study on the combined application of diversified sources of organic nutrients to Basmati rice was undertaken during 2022 at the research farm of ICAR-Indian Agricultural Research Institute (IARI), New Delhi, India. The experimental site is located in the semi-arid sub-tropics having soil belonging to *Typic Ustochrepts*. The climate of New Delhi is semi-arid with dry hot summers and cold winters with an average annual rainfall of 650 mm, 80% of which is received through the 'South–West Monsoon' from July-September and the rest is received from December-March. The soil of the experimental field was sandy clay loam in texture, having a *p*H of 7.35. The field experiment was conducted in randomized block design with 6 treatments viz. control, farmyard manure (FYM) @ 10 t/ha, sesbania green manuring (SGM), SGM + blue-green algae (BGA), SGM + FYM and SGM + FYM+ BGA and replicated thrice.

Among different organic nutrient sources, the highest grain (4.30 t/ha), straw yield (12.58 t/ha) and biological yields (16.90 t/ha) were recorded with the application SGM + FYM + BGA followed by SGM + FYM. The lowest grain (2.23 t/ha) straw yield (8.42 t/ha) and biological yields (10.65 t/ha) were recorded with control (Table 1). Application of SGM + FYM + BGA recorded 48.3%, 33.1% and 36.9% higher grain, straw and biological yields, respectively compared to the control. The highest harvest index (25.6%) was recorded with the application of SGM + FYM + BGA and the lowest with control (20.9%). Further, the application of SGM + FYM + BGA recorded the highest nitrogen content in the grain being 14.4% higher, similarly 20.9% higher zinc concentration in rice grain over the control (Figure 1). Application of SGM + FYM + BGA remained statistically on par with SGM + FYM for most of the attributes.

Based on the long-term study of organic nutrient management options in organically grown *Basmati* rice under the *Basmati* rice-wheat cropping system it can be concluded that the application of *Sesbania* green manuring (SGM) + FYM (10 t/ha) + BGA is one of the best options to achieve the highest productivity and nutritional quality of organically grown *Basmati* rice.

References

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Keywords: blue-green algae, basmati rice, farmyard manure, green manuring

Table 1. Effect of organic nutrient management options on the productivity of *Basmati* rice under the long-term experiment (20 years) at New Delhi, India

Treatment	Grain yield (t/ha)	Straw yield (t/ha)	Biological yield (t/ha)	Harvest Index (%)
Control	2.23^{c}	8.42^{d}	10.65^{d}	20.9^{b}
FYM @ 10 t/ha	3.62^{b}	11.44^{bc}	15.07^{bc}	24.0^{ab}
Sesbania green manuring (SGM)	3.43^{b}	11.13^{c}	14.56^{c}	23.6^{ab}
SGM + Blue-green algae (BGA)	3.63^{b}	11.38^{bc}	15.01^{bc}	24.2^{ab}
SGM + FYM	4.16^{a}	12.35^{ab}	16.51^{ab}	25.2^{a}
SGM + FYM+ BGA	4.30^{a}	12.58^{a}	16.90^{a}	25.6^{a}
SEm (±)	0.097	0.206	0.348	0.725
LSD (P =0 .05)	0.310	0.658	1.118	2.315

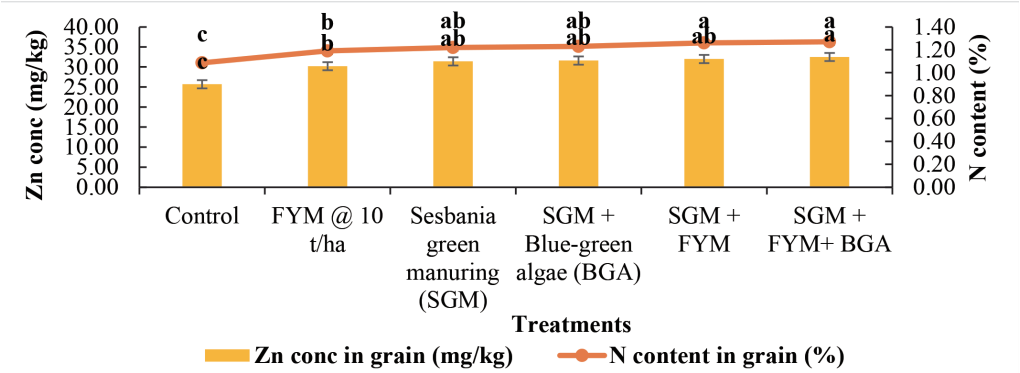
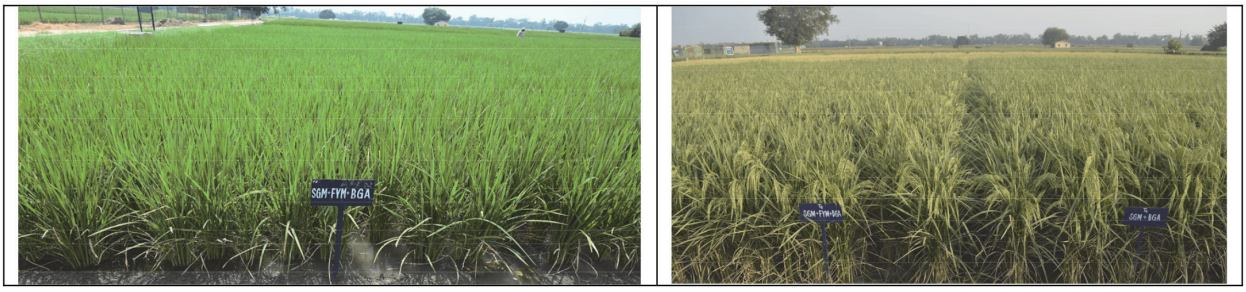


Fig. 1. Effect of nutrient management options on zinc and nitrogen content of organically-grown *Basmati* rice under long-term experiment (20 years) of basmati rice-wheat cropping system



Field experiment treatments photos

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