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RESEARCH ARTICLE

EFFECT OF APPLICATION OF "METABOLIS GOLD" ON GROWTH, YIELD AND QUALITY OF RICE CV. GR 11

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ABSTRACT

The present investigation entitled Effect of application of Metabolis Gold on growth and yield of rice cv. GR11 was carried out during the *kharif* season 2021 on the field of ASPEE, Agricultural Research and Development Foundation, Tansa Farm, At- Nare, Taluka- Wada, Dist- Palghar, Maharashtra, India. The experiment was laid out in Randomized Block Design (RBD). The five treatments (Control, Metabolis Gold @ 0.5 gm, 1.0 gm 2.0 gm, and 3.0 gm / litre water) were replicated four times. The plant height (cm), number of tillers / plant, number of panicles/ plant, number of panicles/ square meter and length of panicle (cm) were found maximum with the application of Metabolis Gold @ 3.0 gm /liter water. The highest number of seeds/ panicle, test weight (gm), grain yield (q/ha) and straw yield (q/ha)were found with the application of Metabolis Gold @ 3.0 gm / litrewater. While, the lowest number of seeds / panicle, test weight, grain yield, and straw yield was found in the control treatment. The data clearly indicated that the yield obtained with treatment T5 (Metabolis Gold @ 3.0 gm / litrewater) was significantly higher than all other treatments, and also for growth parameters.

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INTRODUCTION

Rice is the staple food for more than half of the world's population (Muthayya *et al.,* 2014). In China, rice production and consumption are the highest in the world. China accounts for nearly one-third of the global rice market (Abdullah *et al.,* 2008). To meet the high demand for rice production due to the growing population and economic development, high yield has been the first priority of rice researchers in China for a long time (Peng *et al.,* 2008). In recent years, rice quality has been increasingly important to Chinese consumers as people's living standards improve (Yang *et al.,* 2013).Rice is the most prominent crop of India as it is the staple food for most of the people in India. The rice crop is the backbone of livelihood for millions of rural households. It plays vital role in the country's food security, so the term rice is life is most appropriate in Indian context. India occupies an important position both in the area and production of rice. With the adoption of improved production technologies such as high-yielding varieties/ hybrids, expansion of irrigation potential, and use of chemical fertilizers, the supply of rice in the country has kept pace with the increase in the demand. Demand for rice is expected to further increase in the future as population is continuously increasing, so production of rice also needs to be increased. There is a need to further increase rice productivity because the land area under rice cultivation is declining. Enhancing amino acids in the grain is one of the major objectives for improving the nutritional value of rice (Wang *et al.,* 2008). Major constraints for productivity and sustainability of rice-based systems in the country are the inefficient use of inputs fertilizer, increasing scarcity of water and labor especially for rice cultivation, new emerging challenges from climate change, rising fuel prices, increasing cost of cultivation, and socio-economic changes such as migration of labor, urbanization, less liking for agricultural work by young youths, women's and concerns from environmental pollution as well as weather-based climatic changes. The only way to sustain rice production for meeting the increasing population demand is to increase the productivity per unit of area of rice with enhanced efficient resource use efficiency. For future productivity gain in rice in India, high-yielding varieties that might have resistance to multiple stresses (abiotic and biotic stress), particularly in the wake of climate change need to be explored. Crop production techniques in rice that could increase productivity by efficient utilization of inputs (water, fertilizers, pesticides, etc.), reduce cultivation cost, enhance profit, and provide a safe environment must be explored. Encouraging resource conservation technologies and cultivation of climate-resilient high-yielding varieties through demonstrations and making seeds available to the farmers will be important to sustain rice production in India.

MATERIALS AND METHODS

The experiment was conducted at ASPEE, Agricultural Research and Development Foundation Farm, Village- Nare, Taluka- Wada, District, Palghar in the *kharif* season during 2021 in Randomized Block Design (RBD) with four replications (r=4) (Panse and Sukhatme, 1967). The gross plot size and net plot sizewere3.30 m x 2.85 m, and 3.15 m x 2.80 m, respectively. The experimental site was located at 19.650 N latitudes and 73.130 E longitudes with an average annual rainfall of 3600 mm. Five treatments comprising different levels of Metabolis Gold such as T1 - Control, T2–Metabolis Gold 0.5 gm, T3–Metabolis Gold 1.0 gm, T4–Metabolis Gold 2 gm, and T5–Metabolis Gold 3.0 gm /litre water were tested inrice variety of GR11. Treatments were appliedtwice by spraying over a standing crop. The first spray was applied at 40 days after transplanting, while the second spray was applied 75 days after transplanting of seedling in main field.The positive effects of L series amino acids on rice cv GR 11on growth and production, manifested when it was specifically supplied during the reproductive growth stage (panicle initiation to heading) rather than vegetative and ripening stages, which exerted a feed-forward effect on photosynthesis coupled with an increased in both stomatalconductances.

RESULTS AND DISCUSSION

The L series amino acids are supplied to plants by through foliar application. Glycine and Glutamic Acid are fundamental metabolites in the process of formation of vegetable tissue and chlorophyll synthesis. These Amino Acids help to increase chlorophyll concentration in the plant leading to a higher degree of photosynthesis. This makes the crop lush Green.

Plant growth parameters: The growth period of the rice plant has divided into three stages; vegetative, reproductive and ripening stages. The vegetative stage refers to the period from transplanting to panicle initiation, the reproductive stage from panicle initiation to heading, and the ripening stage from heading to maturity.

Vegetative and reproductive parameters: The plant population/ square meter was found non-significant among all treatments. Plant height was recorded higher in T5 (108.1 cm) which was statistically at par with T4 (107.9 cm) and T3 (107.1 cm). The lowest plant height was recorded in the control treatment as compared to other treatments. The number of tillers/plant was found to be maximum in T5 (12.7) which were statistically at par with T4 (12). The lowest number of tillers/ plant was recorded in the control treatment as compared to other treatments (Table 1 and Chart 1). The lowest number of days to 50% flowering was recorded in T5 (67.3 days) which was statistically at par with T4 (68 days). The maximum number of days to 50% flowering was recorded in the control treatment as compared to other treatments (Table 1 and Chart 1). The number of panicles / plant was recorded maximum in T5 (12.1) which were followed by T4 (10.4). The minimum number of panicles/ plant was recorded in the control treatment. The number of panicles (m^2) was recorded as maximum in T5 (399.8). The minimum number of panicles (m^2) was recorded in the control treatment (Table 1 and Chart 1). The number of seeds / panicle was recorded maximum in T5 (240.5). The minimum number of seeds/panicle was recorded in the control treatment. The test weight (1000 grain wt.) (gm) was recorded maximum in T5 (18.66 gm) which was statistically at par with T4 (18.54 gm). The lowest test weight (1000 grain wt.) (gm) was recorded in the control treatment (Table 1 and Chart 1). The grain yield was recorded maximum in T5 (62 (q/ha) which was statistically at par with T4 (61.4 q/ha), T3 (57.7 q/ha)and T2 (57.3 q/ha). The lowest grain yield (45.0 q/ha) was recorded in the control. The straw yield was recorded maximum in T5 (94.12 Q/ha) which was statistically at par with T4 (92.83 q/ha), T3 (87.09 q/ha) and T2 (86.06 q/ha). The lowest straw yield (67.3 q/ha)was recorded in the control (Table 1 and Chart 1).

Fundamental functions of the amino acids in plants are the anti-stress agent (Hyp, Pro), chelating agent (Cys, Glu, Gly, His, Lys), cold weather resistance (Ala, Arg), generative development of plants and improvement of the plant pollen fertility (Hyp, Pro), growth stimulator (Glu), the precursor of auxin (Ser, Trp, Val), the precursor of chlorophyll (Gly), the precursor of polyamines: necessary to start the cell division (Arg), a precursor to the formation of lignin and woody tissues (Phe), regulation of the water balance (Hyp, Pro, Ser), reserve of organic nitrogen necessary for the synthesis of other amino acids and proteins (Glu), stimulation of the chlorophyll synthesis (Ala, Lys, Ser), stimulation of the ethylene synthesis (Met), stimulation of the germination (Asp, Glu, Lys, Met, Phe, Thr), stimulation of the hormone metabolism (Ala), and stimulation of the resistance mechanism to viruses (Ala) (Baqir *et al*., 2019).

Amino acids also function as biostimulants for plants. As a biostimulant, amino acids can play important roles in enhancing plant productivity, especially under abiotic and biotic stress conditions (Seyed Hossein Mirtaleb *et al.,* 2021).Rice protein is high in the sulfur-containing amino acids, cysteine, and methionine but low in lysine.Nine essential amino acids biosynthesis leleado lysine (Lys), methionine (Met), threonine (Thr), phenylalanine (Phe), tryptophan (Trp), valine (Val), isoleucine (Ile), leucine (Leu), and histidine (His) in plants. Transpiration rate and intracellular CO2 were relatively higher among all amino acid-treated plants (Baqir*et al*., 2019). Amino acids are essential plant compounds serving as the building blocks of proteins, the predominant forms of nitrogen (N) distribution, and signaling molecules. Plant amino acids derive from root acquisition, nitrate reduction, and ammonium assimilation. The role played by accumulated amino acids in plants varies from acting as osmolyte, regulation of ion transport, modulating stomatal opening, and detoxification of heavy metals (Baqir *et al.,* 2019). Glycine and Glutamic Acid are fundamental metabolites in the process of formation of vegetable tissue and chlorophyll synthesis. These Amino Acids help to increase chlorophyll concentration in the plant leading to higher degree of photosynthesis. This makes crops lush Green. Amino acids contribute to increasing the cell ability to uptake water and solvent nutrients from growth media and then increasing the vegetative growth;

Table 1.Effect of application of Metabolis Gold on Growth, Yield and Quality of Rice.

Treatment	Plant population (m²)	Plant height (cm)	No. of tillers per plant	No. of days to 50% flowering	No. of panicles per plant	No. of panicle (m²)	Length of panicle (cm)	No. of seeds per panicle	Test weight (1000 grain wt.) (gm)	Grain Yield (q/ha)	Straw Yield (q/ha)
T1	31	104.5	9.6	80	8.7	260.5	23.9	183.7	17.8	45.0	67.3
T2	33	106.5	10.5	76.8	9.6	301.8	24.5	193.3	18.07	57.3*	86.06*
T3	33	107.1*	11.3	71.8	9.9	327.5	24.7	203.1	18.33	57.7*	87.09*
T4	33	107.9*	12*	68*	10.4	354.6	25.1	210.2	18.54*	61.4*	92.83*
T5	33	108.1	12.7	67.3	12.1	399.8	25.7	240.5	18.66	62.0	94.12
S. Em.±	1.04	0.37	0.25	1.11	0.29	8.05	0.17	5.17	0.08	3.79	5.52
CD @ 0.05	NS	1.13	0.79	3.43	0.89	24.81	0.51	15.92	0.26	11.67	17.02

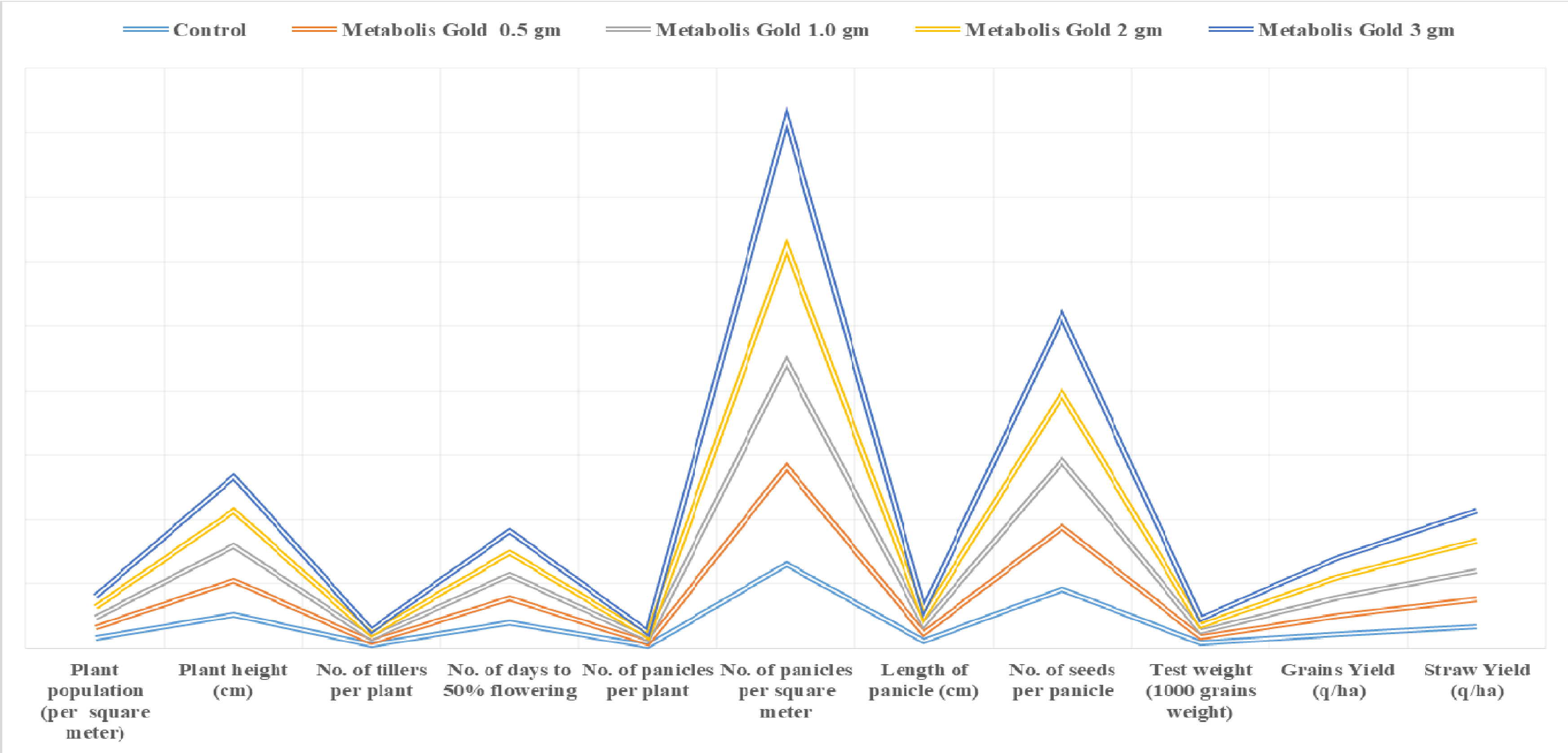

Chart 1.Effect of application of Metabolis Gold on Growth, Yield and Quality of Rice

moreover, they increase synthesizing proteins participating to the multiple functions of plant metabolism and enhance the carbon assimilation rate leading to increasing the total dry matter reflecting on the sink and the yield (Dreccer *et al.,* 2000; and Sharma-Natu and Ghildiyal, 2005). Amino acids are believed to be responsible for enhancing protein contents, cell division, plant pigments, and natural hormonessuch as IAA, GA3, andethylene (Ahmed and Abd El-Hameed, 2003; Ahmed *et al*., 2007 and 2014 and; Madian and Refaai, 2011). Amino acids play an important role as a chelate material for each iron, zinc, copper, magnesium, and calcium as these elements can be absorbed and passed through plants easily with helped of amino acids (*Vernieri et al.,* 2005).

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