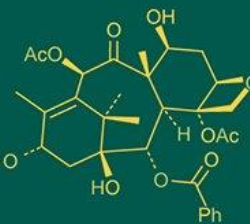
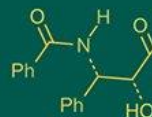
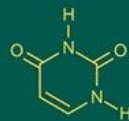
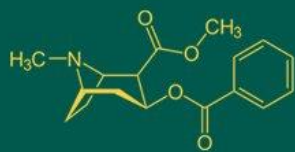


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Effect of integrated phosphorus management in *kharif* rice (*Oryza sativa* L.) on growth, yield, nutrient uptake and economics under saline conditions

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Abstract

A field experiment was carried out on clay soils during *kharif*, 2025-2026 at OFT Farm, Saline Water Scheme, Bapatla to assess the Effect of Integrated phosphorus management in *kharif*, Rice (*Oryza sativa* L.) under saline conditions. The experiment was laid out in a randomized block design with nine treatments and three replications. The results of the investigation revealed that growth characters such as plant height, drymatter, yield attributing characters, grain yield and straw yield, N uptake, P uptake and K uptake, maximum gross and net returns among all the treatments were significantly higher with application of 100% RDP + PSB + VAM, which was at par with the application of 100% RDP + PSB and 100% RDP + VAM.

Keywords: Phosphorus Solubilizing Bacteria (PSB), Vesicular Arbuscular Mycorrhizae (VAM), drymatter, grain yield

Introduction

Rice (*Oryza sativa* L.) is one of the most important food crops in the world and serves as the primary staple food for a large proportion of the global population, particularly in developing countries. It plays a vital role in ensuring food and nutritional security and contributes significantly to the livelihood of millions of farmers Mrudhula *et al.* (2021) ^[13]. India is one of the largest producers and consumers of rice, with the crop occupying a substantial share of the country's cultivated area and agricultural economy. Rice cultivation is practiced under diverse agro-climatic conditions, ranging from irrigated ecosystems to rainfed and stress-prone environments. In several rice-growing regions, especially in eastern and central India, rice remains the dominant cropping system due to its adaptability and socio-economic importance Mrudhula *et al.* (2024) ^[14]. However, sustaining rice productivity under challenging environmental conditions, particularly soil salinity, remains a major concern for achieving long-term food security and agricultural sustainability.

Phosphate-solubilizing bacteria (PSB), including species of *Bacillus*, *Pseudomonas*, *Rhizobium*, *Enterobacter*, and *Azospirillum*, improve phosphorus availability in soil by producing organic acids such as gluconic, citric, oxalic, and malic acids. These acids reduce the pH in the rhizosphere and dissolve insoluble phosphate compounds, thereby releasing phosphorus in a form readily available for plant uptake. Under saline conditions, salt-tolerant PSB strains remain active and continue to solubilize phosphorus effectively, thereby enhancing phosphorus availability to plants. In addition, PSB produce phosphatase enzymes, such as acid and alkaline phosphatases, which convert organic forms of phosphorus into plant-available inorganic phosphorus.

Vesicular-arbuscular mycorrhizae (VAM) form beneficial symbiotic associations with the roots of most crop plants, including rice. VAM develops an extensive network of fungal hyphae that extends beyond the root zone, increasing the effective surface area for nutrient and water absorption. This expanded hyphal network enables plants to access phosphorus from soil regions that are otherwise unavailable to roots alone, thereby improving phosphorus uptake, nutrient use efficiency, and plant tolerance to salinity stress.

To address the challenges associated with phosphorus availability in saline soils, Integrated Phosphorus Management (IPM) has gained importance as a sustainable nutrient management

approach. This strategy combines inorganic phosphorus fertilizers with biofertilizers and other nutrient sources to improve phosphorus availability, enhance soil fertility, and reduce the excessive reliance on chemical fertilizers. Among the biofertilizers, Phosphate-Solubilizing Bacteria (PSB) and Vesicular-Arbuscular Mycorrhizae (VAM) play a significant role in saline environments by increasing the solubilization and mobilization of phosphorus, improving nutrient and water uptake, promoting root growth, and enhancing plant tolerance to salinity stress through beneficial microbial interactions.

Materials and Methods

A field experiment was conducted at OFT farm, Saline Water Scheme Bapatla, Andhra Pradesh during *khari*f, 2025. The soil of the experimental field was clay in texture, neutral in reaction with pH 7.52, electrical conductivity 6.4 dS m^{-1} , saline, medium in organic carbon, low in available nitrogen, medium in available phosphorus and medium in available potassium. The experiment was laid out in Randomized Block Design with 9 treatments replicated thrice. The treatments include, T₁: Control (no P); T₂: 100% RDP ($60 \text{ kg P}_2\text{O}_5 \text{ ha}^{-1}$); T₃: 100% RDP + PSB; T₄: 100% RDP + VAM; T₅: 100% RDP + PSB + VAM; T₆: 75% RDP; T₇: 75% RDP + PSB; T₈: 75% RDP + VAM; and T₉: 75% RDP + PSB + VAM. Nutrient NPK was applied in the form of urea, Single Super Phosphate (SSP) and Muriate of Potash (MOP) respectively. Nitrogen was applied in three equal splits *i.e.*, as basal, 30 DAT and 60 DAT and entire dose of phosphorus was applied as basal, for treatments receiving 100% RDP, $60 \text{ kg P}_2\text{O}_5 \text{ ha}^{-1}$ was applied, while for treatments receiving 75% RDP, $45 \text{ kg P}_2\text{O}_5 \text{ ha}^{-1}$ was applied. Potassium was applied in two splits at *i.e.* basal and at 30 DAT. In case of biofertilizers *i.e.* PSB (Phosphate solubilizing bacteria), and VAM (vesicular arbuscular mycorrhizae) were thoroughly mixed with vermicompost and applied in experimental plots as per the treatments. Gap filling, weeding, irrigation and other necessary intercultural operations were done in proper time. Harvesting was done plot wise, five hills were selected randomly from each unit plot for taking yield component data at harvest. One m^2 area from each plot was selected from the central portion and was cut manually from the ground level to take grain and straw yields. The harvested crop of each plot was separately bundled, properly tagged and then brought to the threshing floor. The harvested crops were threshed manually. The grain was cleaned and dried to a moisture content of 14 percent. Straws were sun dried properly. Data recorded for yield parameters were compiled and tabulated in proper form for statistical analysis (Gomez and Gomez 1984) [8].

Results and Discussion

Plant height (cm)

Plant height was significantly influenced by phosphorus levels and biofertilizer treatments. Among treatments, significantly the tallest plants (128.7 cm) were recorded with (T₅) 100% RDP + PSB + VAM, which was at par with (T₃) 100% RDP + PSB and (T₄) 100% RDP + VAM. Significantly lowest plant height (101.7 cm) was recorded with control treatment. The superiority of dual biofertilizer treatment over single application or sole P supply can be attributed to the complementary action of PSB, which solubilizes native and applied phosphorus, and VAM, which extends the effective absorption surface through its hyphal network, together

improving overall P availability and uptake. These findings align with those of Chinnusamy *et al.* (2006) [5] and Anjali *et al.* (2022) [2].

Drymatter accumulation (kg ha^{-1})

Drymatter accumulation at harvest was significantly influenced by phosphorus levels and biofertilizers treatments. Among different phosphorus levels, significantly higher drymatter accumulation (13523 kg ha^{-1}) was recorded with (T₅) 100% RDP + PSB + VAM, which was at par with (T₃) 100% RDP + PSB and 100% RDP + VAM. Significantly lowest plant height (101.7 cm) was recorded with control treatment. Gudarankaiah *et al.* (2021) [8] reported that combined contribution of phosphorus to photosynthetic efficiency and of PSB and VAM to improved root proliferation, nutrient mobilization, and maintenance of plant physiological status under salt stress, with the two biofertilizers acting synergistically when applied together. These were in agreement with the findings of and Bhavani *et al.* (2013) [3] and Prasanthaik *et al.* (2020) [16].

Number of productive tillers m^{-2}

Number of productive tillers m^{-2} recorded at harvest in different treatments of rice was found comparable with each other and significant difference was observed in number of productive tillers tested under study. At harvest, significantly the highest number of productive tillers m^{-2} (321.0) was observed in (T₅) 100% RDP + PSB + VAM, which was at par with (T₃) 100% RDP + PSB (313.0), (T₄) 100% RDP + VAM (312.3), (T₉) 75% RDP + PSB + VAM (308.0), (T₇) 75% RDP + PSB (306.7), (T₈) 75% RDP + VAM (305.0) and (T₂) RDP ($60 \text{ kg P}_2\text{O}_5 \text{ ha}^{-1}$) (302.7). Significantly lowest number of productive tillers (277.3) was recorded with (T₁) control treatment. The higher number of productive tillers per m^2 recorded under integrated phosphorus management treatments may be due to improved phosphorus nutrition and better translocation of assimilates from source to sink. Enhanced nutrient uptake through PSB and VAM supports tiller survival and reduces tiller mortality during the reproductive stage was reported Prasanth Naik *et al.* (2020) [16].

Panicle length (cm)

Panicle length (cm) recorded at harvest in different treatments of rice were found comparable with each other and significant difference was observed in panicle length tested under study. At harvest, significantly the highest panicle length (22.0 cm) was observed in (T₅) 100% RDP + PSB + VAM, which was at par with (T₃) 100% RDP + PSB (21.7 cm), (T₄) 100% RDP + VAM (21.3 cm) and (T₉) 75% RDP + PSB + VAM (20.7 cm). Significantly lowest panicle length (18.7 cm) was recorded with (T₁) control treatment. The increased panicle length observed under integrated phosphorus management treatments may be attributed to improved phosphorus availability and enhanced nutrient uptake facilitated by PSB and VAM. Lakshmi *et al.* (2020) [12] reported that adequate phosphorus nutrition promotes cell division, cell elongation, and translocation of assimilates to the developing reproductive organs.

Panicle weight (g)

Panicle weight (g) recorded at harvest in different treatments of rice were found comparable with each other and significant difference was observed in panicle weight tested under study.

At harvest, significantly the highest panicle weight (3.3 g) was observed in (T₅) 100% RDP + PSB + VAM, which was at par with (T₃) 100% RDP + PSB (3.2 g), (T₄) 100% RDP + VAM (3.1 g) and (T₉) 75% RDP + PSB + VAM (3.1 g). Significantly lowest panicle weight (2.6 g) was recorded with (T₁) control treatment. The significant increase in panicle weight under integrated phosphorus management treatments may be attributed to enhanced phosphorus availability, improved nutrient uptake, and greater assimilate translocation facilitated by PSB and VAM. Singh *et al.* (2015) [20] reported that improved phosphorus nutrition supports reproductive development and grain filling through enhanced photosynthetic efficiency and energy metabolism.

Number of filled grains panicle⁻¹

Number of filled grains panicle⁻¹ recorded in different phosphorus levels was found comparable with each other and significant difference was observed in number of filled grains panicle⁻¹ of different treatments tested under study. At harvest, significantly the highest number of filled grains panicle⁻¹ (214.3) was observed in (T₅) 100% RDP + PSB + VAM, which was at par with (T₃) 100% RDP + PSB (207.3), (T₄) 100% RDP + VAM (204.7) and (T₉) 75% RDP + PSB + VAM (200.7). Significantly lowest number of filled grains per panicle (160.0) was recorded with (T₁) control treatment. The higher number of filled grains per panicle recorded under integrated phosphorus management treatments may be due to improved nutrient availability and enhanced assimilate translocation during the reproductive stage. Hasani and Aminpanah *et al.* (2015) [11] reported that adequate phosphorus nutrition supports flowering, pollination, and grain filling processes, while PSB and VAM improve nutrient uptake and maintain plant vigor under saline conditions.

Grain Yield (kg ha⁻¹)

Significantly the highest grain yield (5140 kg ha⁻¹) was obtained with (T₅) 100% RDP + PSB + VAM highlighting the effectiveness of nutrient application along with biofertilizers in realizing higher productivity. This treatment was statistically at par with (T₃) 100% RDP + PSB (4947 kg ha⁻¹), (T₄) 100% RDP + VAM (4917 kg ha⁻¹), (T₉) 75% RDP + PSB + VAM (4900 kg ha⁻¹) (T₇) 75% RDP + PSB (4783 kg ha⁻¹) and (T₈) 75% RDP + VAM (4753 kg ha⁻¹). Significantly lowest grain yield (3617 kg ha⁻¹) was recorded with (T₁) control treatment. Pratibha Rawat *et al.* (2020) [17] revealed that these assimilates were subsequently translocated to the developing grains, resulting in improved grain filling and higher yield. Furthermore, sufficient nutrient supply during the early growth stages supports better plant growth and development, which ultimately contributes to increased productivity. Similar findings have been reported by Gudarankaiah *et al.* (2021) [9], Tejaswini *et al.* (2017) [21], Bhavani *et al.* (2013) [3] and Verma *et al.* (2017) [22].

Straw Yield (kg ha⁻¹)

Straw yield recorded at harvest in different treatments of rice were found comparable with each other and significant difference was observed in straw yield tested under study. Significantly highest straw yield (5383 kg ha⁻¹) was obtained with (T₅) 100% RDP + PSB + VAM this treatment was statistically at par with (T₃) 100% RDP + PSB (5150 kg ha⁻¹), (T₄) 100% RDP + VAM (5033 kg ha⁻¹), (T₉) 75% RDP + PSB + VAM (4917 kg ha⁻¹) (T₇) 75% RDP + PSB (4900 kg ha⁻¹) and (T₈) 75% RDP + VAM (4833 kg ha⁻¹). Significantly

lowest straw yield (4400 kg ha⁻¹) was recorded with (T₁) control treatment. The increased straw yield may be attributed to the synergistic effect of phosphorus fertilization along with PSB and VAM, which enhanced phosphorus availability and uptake, leading to improved root growth, nutrient absorption, and vegetative development. Prasanthnaik *et al.* (2020) [16] reported that enhanced phosphorus nutrition promotes cell division and photosynthetic efficiency resulting in greater dry matter production and straw yield.

Harvest Index (%)

Harvest index was not significantly influenced by integrated phosphorus management and varied from 0.45 to 0.50. The highest harvest index (0.50) was recorded with (T₅) 100% RDP + PSB + VAM, while the lowest (0.45) was observed in the control (T₁). The higher harvest index under biofertilizer-integrated treatments may be attributed to enhanced phosphorus availability, improved nutrient uptake, and efficient translocation of photosynthates towards grain production. This resulted in better conversion of total biomass into economic yield compared to the control. These were in agreement with the findings of Senthamizh kumaran *et al.* (2021) [19] and Dhurve *et al.* (2023) [6].

Nitrogen uptake

Nitrogen uptake by grain varied significantly among the treatments. Significantly the highest nitrogen uptake by grain (58.7 kg ha⁻¹) was observed in (T₅) 100% RDP + PSB + VAM, which was at par with (T₃) 100% RDP + PSB (57.3 kg ha⁻¹), (T₄) 100% RDP + VAM (56.0 kg ha⁻¹) and (T₉) 75% RDP + PSB + VAM (52.3 kg ha⁻¹). Significantly the lowest nitrogen uptake by grain (32.7 kg ha⁻¹) was recorded in the (T₁) control treatment. The increased nitrogen uptake by grain observed under integrated phosphorus management treatments may be attributed to improved phosphorus availability and enhanced root growth facilitated by PSB and VAM. Adequate phosphorus nutrition promotes root proliferation and nutrient absorption, resulting in greater nitrogen uptake throughout the crop growth period, as reported by Naskar and Mallick (2023) [15].

Similarly, nitrogen uptake by straw was also significantly influenced by integrated phosphorus management treatments. Significantly the highest nitrogen uptake by straw (54.7 kg ha⁻¹) was observed in (T₅) 100% RDP + PSB + VAM, which was at par with (T₃) 100% RDP + PSB (52.0 kg ha⁻¹), (T₄) 100% RDP + VAM (49.7 kg ha⁻¹), (T₉) 75% RDP + PSB + VAM (48.3 kg ha⁻¹) and (T₇) 75% RDP + PSB (45.0 kg ha⁻¹). Significantly the lowest nitrogen uptake by straw (31.3 kg ha⁻¹) was recorded in the (T₁) control treatment. The higher nitrogen uptake by straw may be attributed to increased vegetative growth, dry matter production, and enhanced nutrient absorption under integrated phosphorus management.

Phosphorus uptake

Phosphorus uptake by grain varied significantly among the treatments. Significantly the highest phosphorus uptake by grain (42.5 kg ha⁻¹) was observed in (T₅) 100% RDP + PSB + VAM, which was at par with (T₃) 100% RDP + PSB (40.2 kg ha⁻¹), (T₄) 100% RDP + VAM (37.1 kg ha⁻¹), and (T₉) 75% RDP + PSB + VAM (35.4 kg ha⁻¹). Significantly the lowest phosphorus uptake by grain (24.2 kg ha⁻¹) was recorded in the (T₁) control treatment. The increased phosphorus uptake

by grain under integrated phosphorus management treatments may be attributed to enhanced phosphorus availability and uptake throughout the crop growth period, facilitated by the combined action of PSB and VAM. Improved phosphorus nutrition promotes grain formation, grain filling, and efficient translocation of phosphorus from vegetative tissues to reproductive organs, resulting in greater phosphorus accumulation in grains, as reported by Raki *et al.* (2019)^[18]. The higher grain yield and improved grain development observed under biofertilizer-treated plots also contributed to increased phosphorus uptake by grain.

Similarly, phosphorus uptake by straw was significantly influenced by integrated phosphorus management treatments. Significantly the highest phosphorus uptake by straw (38.4 kg ha⁻¹) was observed in (T₅) 100% RDP + PSB + VAM, which was at par with (T₃) 100% RDP + PSB (35.8 kg ha⁻¹) and (T₄) 100% RDP + VAM (33.7 kg ha⁻¹). Significantly the lowest phosphorus uptake by straw (19.8 kg ha⁻¹) was recorded in the (T₁) control treatment. The higher phosphorus uptake by straw may be attributed to increased vegetative growth, enhanced root development, and improved phosphorus availability resulting from the combined application of inorganic fertilizers and biofertilizers. Ghosh *et al.* (2023)^[7] reported that the integration of inorganic phosphorus fertilizers with phosphorus-solubilizing microorganisms enhances phosphorus mobilization and uptake by solubilizing fixed soil phosphorus and increasing the production of organic acids in the rhizosphere. Similarly, Gupta *et al.* (2023)^[10] observed that the application of biofertilizers significantly increased phosphorus uptake by both grain and straw, thereby improving phosphorus availability, nutrient absorption, and crop productivity.

Potassium uptake

Although differences in potassium were non-significant, a consistent increasing trend was observed with combined application of inorganic fertilizers and biofertilizers. Grain potassium uptake exhibited significant variation, with the maximum uptake (35.3 kg ha⁻¹) recorded in was observed in (T₅) 100% RDP + PSB + VAM and (T₃) 100% RDP + PSB (35.3 kg ha⁻¹), which was at par with (T₄) 100% RDP + VAM (31.7 kg ha⁻¹) and (T₉) 75% RDP + PSB + VAM (30.0 kg ha⁻¹). Significantly lowest K uptake (20.7 kg ha⁻¹) was recorded with (T₁) control treatment. The increased potassium uptake by grain observed under integrated phosphorus management treatments may be attributed to improved root growth,

enhanced nutrient availability, and greater nutrient absorption facilitated by PSB and VAM. Potassium plays a vital role in enzyme activation, photosynthesis, osmotic regulation, and assimilate translocation. Raki *et al.* (2019)^[18] reported that improved root system developed under biofertilizer inoculation enables efficient uptake of potassium from the soil, while enhanced phosphorus nutrition promotes better plant growth and grain development. Furthermore, under saline conditions, adequate potassium uptake helps maintain ionic balance by reducing sodium toxicity, resulting in greater potassium accumulation in grains and improved grain quality.

Similarly, significantly highest K uptake by straw (48.7 kg ha⁻¹) was observed in (T₅) 100% RDP + PSB + VAM, which was at par with (T₃) 100% RDP + PSB (45.3 kg ha⁻¹) and (T₄) 100% RDP + VAM (42.0 kg ha⁻¹). Significantly lowest K uptake (27.3 kg ha⁻¹) was recorded with (T₁) control treatment. The higher potassium uptake by straw may be attributed to increased vegetative growth and biomass accumulation resulting from improved nutrient acquisition under integrated phosphorus management. PSB and VAM enhance root proliferation and nutrient absorption, allowing plants to extract greater quantities of potassium from the soil. Ajit Kumar *et al.* (2023)^[1] reported that potassium is involved in maintaining cell turgor, stomatal regulation, and photosynthetic efficiency, which contribute to enhanced growth and dry matter production.

Economics

The economics of integrated phosphorus management in rice under saline conditions are presented in Table 4 shows that treatment T₅ recorded significantly the highest total cost of cultivation (72210 Rs ha⁻¹) among all the treatments. The lowest cost of cultivation was in recorded in control (31400 Rs ha⁻¹). The highest gross income was found in treatment T₅ (137262 Rs ha⁻¹) among all the treatments which was at par with T₃ (132037 Rs ha⁻¹) and treatment T₄ (131066 Rs ha⁻¹) whereas, significantly the lowest gross income (97806 Rs ha⁻¹) was observed in control. The highest net returns were recorded in treatment T₅ (54285 Rs ha⁻¹) among all the treatments which was at par with T₃ (50536 Rs ha⁻¹) and treatment T₄ (49797 Rs ha⁻¹). The maximum B: C ratio was calculated in treatment T₅ (0.75) followed by treatment T₉ (0.71) while the minimum B: C ratio was recorded in control (0.52). These results were in line with the findings of Borkar *et al.* (2008)^[4].

Table 1: Influence of integrated phosphorus management on plant height, drymatter production, Productive tillers m⁻² and panicle length in rice under saline conditions

Treatments	Plant height (cm)	Drymatter production (kg ha ⁻¹)	Productive tillers m ⁻²	Panicle length (cm)
T ₁ -Control	101.7	9200	277	18.7
T ₂ -RDP (60 kg P ₂ O ₅ ha ⁻¹)	108.7	9900	302	19.3
T ₃ -100% RDP + PSB	124.7	12097	313	21.7
T ₄ -100% RDP + VAM	123.3	11950	312	21.3
T ₅ -100% RDP + PSB + VAM	128.7	13523	321	22.0
T ₆ -75% RDP	107.3	9703	296	19.3
T ₇ -75% RDP + PSB	120.0	10683	306	20.3
T ₈ -75% RDP + VAM	108.7	10253	305	19.7
T ₉ -75% RDP + PSB + VAM	121.3	10967	308	20.7
S Em±	6.55	542.9	6.36	0.54
CD (P = 0.05)	19.6	1627.7	19.0	1.6
CV%	9.8	9.8	8.3	8.6

Table 2: Influence of integrated phosphorus management on panicle weight, No. of filled grains panicle⁻¹, grain and straw yield in rice under saline conditions rice

Treatments	Panicle Weight (g)	No. of filled grains panicle ⁻¹	Grain yield (kg ha ⁻¹)	Straw yield (kg ha ⁻¹)	Harvest Index
T ₁ -Control	2.6	160.0	3617	4400	0.45
T ₂ -RDP (60 kg P ₂ O ₅ ha ⁻¹)	2.9	184.7	4383	4717	0.48
T ₃ -100% RDP + PSB	3.2	207.3	4947	5150	0.49
T ₄ -100% RDP + VAM	3.1	204.7	4917	5033	0.49
T ₅ -100% RDP + PSB + VAM	3.3	214.3	5140	5383	0.50
T ₆ -75% RDP	2.7	177.0	4350	4553	0.48
T ₇ -75% RDP + PSB	3.0	196.3	4783	4900	0.49
T ₈ -75% RDP + VAM	2.9	188.0	4753	4833	0.48
T ₉ -75% RDP + PSB + VAM	3.1	200.7	4900	4917	0.49
S Em±	0.12	5.94	252.0	185.8	0.9
CD (P = 0.05)	0.3	17.8	755.6	557.1	NS
CV%	6.9	8.5	9.4	8.6	6.6

Table 3: Influence of integrated phosphorus management on Nitrogen, phosphorus and potassium uptake in grain and straw in rice under saline conditions rice

Treatments	Nitrogen uptake (kg ha ⁻¹)		Phosphorus uptake (kg ha ⁻¹)		Potassium uptake(kg ha ⁻¹)	
	Grain	Straw	Grain	Straw	Grain	Straw
T ₁ -Control	32.7	23.3	14.2	10.8	20.7	27.3
T ₂ -RDP (60 kg P ₂ O ₅ ha ⁻¹)	40.0	22.0	21.5	12.2	25.0	32.7
T ₃ -100% RDP + PSB	57.3	39.0	30.2	20.8	35.3	45.3
T ₄ -100% RDP + VAM	56.0	36.7	27.1	19.7	31.7	42.0
T ₅ -100% RDP + PSB + VAM	58.7	41.7	32.5	23.4	35.3	48.7
T ₆ -75% RDP	37.3	27.7	19.2	11.4	23.0	30.3
T ₇ -75% RDP + PSB	50.7	32.0	23.0	14.1	28.7	38.7
T ₈ -75% RDP + VAM	46.3	30.7	22.3	13.2	26.3	35.0
T ₉ -75% RDP + PSB + VAM	52.3	35.3	25.4	17.0	30.0	40.0
S Em±	3.4	3.5	2.5	1.9	2.0	2.7
CD (P = 0.05)	10.1	10.6	7.4	5.7	6.0	8.1
CV%	12.2	13.8	12.5	11.7	12.2	12.4

Table 4: Gross Returns (Rs. ha⁻¹), Net Returns (Rs. ha⁻¹), B: C ratio and Cost of cultivation of rice as influenced by integrated phosphorus management under saline conditions

Treatments	Cost of cultivation	Gross Returns	Net Returns	B C ratio
T ₁ -Control	64710	97806	33730	0.52
T ₂ -RDP (60 kg P ₂ O ₅ ha ⁻¹)	70710	117307	37156	0.53
T ₃ -100% RDP + PSB	71210	132037	50536	0.71
T ₄ -100% RDP + VAM	71210	131066	49797	0.70
T ₅ -100% RDP + PSB + VAM	72210	137262	54285	0.75
T ₆ -75% RDP	69210	116160	37844	0.55
T ₇ -75% RDP + PSB	69710	127518	48000	0.69
T ₈ -75% RDP + VAM	69710	126646	47261	0.68
T ₉ -75% RDP + PSB + VAM	70710	130422	49879	0.71
S Em±		3873.1	3873.1	0.1
CD (P = 0.05)		11611.5	11611.5	0.2
CV%		5.4	8.9	7.4

Conclusion

Based on the findings, it can be concluded that application of inorganic nutrients along with biofertilizers had significantly improved the crop growth, yield attributes, yield and economics of rice. The application of inorganic nutrients along with biofertilizers T₅ (100% RDP + PSB + VAM) outperformed all other treatments in crop growth yield attributes, yield and economics while T₇ (75% RDP + PSB + VAM) showed promising positive results on yield and economics of rice.

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