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INFLUENCE OF SULPHATE OF POTASH AND MURAITE OF POTASH ON DRY MATTER PRODUCTION AND YIELD IN RICE VAR (ADT 43) GROW IN THE SOUTH EAST COASTAL REGIONS OF TAMILNADU, INDIA

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Abstract

A field experiment was conducted to study the impact of soil application of KCl (MOP) and foliar application of K_2SO_4 (SOP) on growth, yield and nutrient uptake parameters in rice Var. ADT 43. Data recorded on, grain yield, straw yield and dry matter production were scrutinized. The field experiment was conducted in the Kuruvai season (June-Sep). Rice variety ADT 43 with duration of 110 days was the test crop which was raised during 2015. The plot size was 5×8 m2 and the spacing adopted was 12.5cm×15cm. The experiment was carried out in randomized block design with nine treatments and three replications. The results indicated that combined application of 100% potassium through MOP along with 2% SOP applied through sprays exhibited higher growth and yield attributes than those plots which did not receive potassic fertilizers. The grain and straw yields, dry matter production and the nutrient uptake (N, P, K) were significantly higher in the treatments received combined application of 100% potassium through MOP along with SOP applied through sprays over the control plots. However, the treatment was on par with the treatment which received one spray of 1% SOP and 100% MOP through three split application.

Key words : Potassium, Rice, coastal soils, Muraite of potash, Sulphate of potash.

Introduction

Rice is the staple food of more than 60 percent of world's population. Rice is a supreme commodity to mankind. In recognition to the important traits of rice, the United Nations declared the year 2004 as the International year of rice. After China, India contributes 21.5 percent of global rice production. Rice occupies a pivotal place in Indian agriculture and is grown on more than 44 million hectares and accounts for about 43 per cent of total food grains production in the country (Pradhan *et al*., 2013). Fertilizer use is one of the four major inputs that contribute substantially to increase crop production. The others are irrigation, better seeds and plant protection, (Krauss, 2001). Soil factors, nutrient management, adequate irrigation, better seeds and plant protection are the main management factors that would help to increase the productivity. Yield increases in recent years were undoubtedly associated with high yield potentials of improved varieties in rice crop. But, the most marked fluctuations in yields are associated with nutrient management factors. These factors have to be managed efficiently to realize the full yield potentials of rice crop. Hence, a study was undertaken to research upon the effect of different levels of potassium using muriate of potash and foliar application of sulphate of potash on growth and yield parameters of rice, with the following objectives. To evaluate potassium release kinetics of different soil series in Tamil Nadu. To assess the effect of potassium on the growth components of rice. To monitor the interactive effect of different dose of potassium using muriate of potash and foliar application of sulphate of potash on the yield of rice crop.

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Materials and Methods

Field experiment was carried out at Annamalai University Experimental farm, Faculty of Agriculture, Annamalai University, Annamalai Nagar during June-September, 2015 (kuruvai) to study the effect of potassic

fertilizers of KCl (MOP) and K_2SO_4 (SOP) on growth, yield and nutrient uptake parameters in rice Var. ADT 43.A recommended fertilizer dose of 100:50:50 kg N, P_2O_5 and K_2O ha^{-1} was applied following the treatment schedule. The potassium source *viz.*, KCl (MOP) and K_2SO_4 (SOP) were applied according to treatment schedule and compared with control treatment. A recommended fertilizer dose of 100 and 50 kg N and P_2O_5 was applied to all plots in the form of urea and SSP respectively. The experiment was conducted with nine treatments as given below:

T_1 - Absolute control (No NPK)

T_2 - K Control (NP alone)

T_3 - NP + K as 100 % MOP through soil application in four splits at basal, active tillering, panicle initiation and heading

T_4 - NP + K as 100% MOP through soil application in three equal splits at basal, active tillering and panicle initiation + one spray of 1% SOP at heading

T_5 - NP + K as 100% MOP through soil application in three equal splits at basal, active tillering and panicle initiation + one spray of 2% SOP at heading

T_6 - NP + K as 75% MOP though soil application in two equal splits at Basal and active tillering + two sprays of 1% SOP at panicle initiation and heading

T_7 - NP + K as 75% MOP trough soil application in two equal splits at basal and active tillering + two sprays of 2% SOP at panicle initiation and heading

T_8 - NP + K as 50% MOP through soil application in two equal splits at basal and active tillering + two sprays of 1% SOP at panicle initiation and heading

T_9 - NP + K as 50% MOP through soil application in two equal splits at basal and active tillering + two sprays of 2% SOP at panicle initiation and heading.

Intercultural operations were carried out regularly, the biometric, growth, yield parameters were recorded periodically and the data were analyzed statistically .

Results and Discussion

The present study was taken up with the aim of investigating the effect of potassic fertilizers KCl (MOP) and K_2SO_4 (SOP) on yield and nutrient uptake parameters in rice ADT 43. The experiments were conducted in Kuruvai season (June-Sep, 2015). The data on grain and straw yields, dry matter production were recorded. Further, samples were analyzed for N, P and K and nutrient uptake of nutrients in rice grain and straw were computed. The data recorded in the laboratory investigations and field experiments were statistically analyzed and the results were recorded.

The data presented in table 1, revealed that the application of potassic fertilizers muriate of potash and sulphate of potash in different levels significantly increased the grain yield. The treatment with application of 100% of muriate of potash along with 2% sulphate of potash in 1 spray (T_5) registered the highest grain yield 5520 kg ha-^{1} and it was statistically comparable with T_4 which received 100% muriate of potash along with 1% sulphate of potash in one spray which recorded 5453 kg $ha^{-1.}$ This was followed by the treatments T_3, T_7, T_6, T_9, T_8, T_2 and T_1 recorded at 4928kg ha^{-1}, 4659kg ha^{-1}, 4183kg ha^{-1}, 3703kg ha^{-1}, 3268kg ha^{-1}, 2873kg ha^{-1} and 2373kg ha^{-1} respectively. The data presented in table 1, 4 revealed that the application of potassic fertilizers, muriate of potash and sulphate of potash in different levels significantly increased the straw yield. The treatment with application of 100% of muriate of potash along with 2% sulphate of potash in 1 spray (T_5) registered the highest straw yield 6972 kg ha^{-1} respectively and it was statistically comparable with T_4 which received 100% muriate of potash along with 1% Sulphate of potash in one spray recorded 6911 kg ha^{-1} at straw yield. This was followed by the treatments T_3, T_7, T_6, T_9, T_8, T_2 and T_1 which recorded 6001kg ha^{-1}, 5850kg ha^{-1}, 5601kg ha^{-1}, 5527kg ha^{-1}, 5412kg ha^{-1}, 4703kg ha^{-1} and 3639kg ha^{-1} respectively.

The treatment with application of 100% of muriate of potash along with 2% sulphate of potash in 1 spray (T_5) registered the highest dry matter production 12573 kg ha^{-1} respectively and it was statistically comparable with

Table 1: Application MOP and SOP on grain yield, straw yield and DMP yield at harvest (var ADT 43). (kg/ha).

Treatment	Grain yield (kg/ha)	Straw yield (kg/ha)	DMP yield (kg/ha)
T_1 control	2373	3639	6287
T_2 (NP)	2873	4703	7883
T_3 (NPK)	4928	6001	11260
T_4 (RD + 1% SOP in 1sprays)	5453	6911	12540
T_5 (RD + 2% SOP in 1 sprays)	5520	6972	12573
T_6 (75% MOP +1% SOP in 2 sprays)	4183	5601	9996
T_7 (75% MOP + 2% SOP in 2 sprays)	4659	5850	10646
T_8 (50% MOP + 1% SOP in 2 sprays)	3268	5412	8946
T_9 (50% MOP + 2% SOP in 2 sprays)	3703	5527	9398
SED	62.1	103.5	32.30
CD(P=0.05)	124	207	69

treatment T_4 which received 100% muriate of potash along with 1% sulphate of potash in one spray recorded 12540 kg ha^{-1} at dry matter production. This was followed by the treatments T_3, T_7, T_6, T_9, T_8, T_2 and T_1 recorded at 11260kg ha^{-1}, 10646kg ha^{-1}, 9996kg ha^{-1}, 9398kg ha^{-1}, 8946kg ha-1, 7883kg ha^{-1} and 6287kg ha^{-1} respectively. The lowest value was recorded in treatment T_1 (without fertilizers). The combined application of potassium 100 percent muriate of potash along with sulphate recorded higher grain, straw and DMP yield compared to control and lower doses of application of muriate of potash and sulphate of potash. The results infer that the potassium added in term of muriate of potash followed by sprays of sulphate of potash along with the recommended dose of nitrogen and phosphorus had a positive influence of growth characters and yield parameters of rice crop. The highest growth characters *i.e*. plant height and yield attributes were recorded in T_5 which was statistically on par with T_4 over the absolute control (T_0) and (T_1) which did not receive any potassium fertilizer. The results infer that application of potassium in split doses through soil *i.e.* of potash and spraying of potassium as sulphate of potash during different growth stages increased the availability of potassium by the rice crop. Similar results were reported by Surendran (2000).

Potassium concentrations of 100 mM seem to be necessary for a high efficiency of photo-phosphorylation. It has been proven that plants with higher leaf potassium contents have higher rates of ATP synthesis. Potassium ions play various roles in the translocation of assimilates, meristematic growth, maintenance of the water regime of the plant, photosynthesis and the translocation of photosynthesis (Mengel and Kirkby, 1987). Potassium has a pronounced positive effect on the number of spikelet and the percentage of ripened grains. As for tillering favorable nitrogen: potassium balance is most important for the formation of an adequate number of spikelet and high percentage of ripened grains. The potassium requirement for spikelet and grain formation is higher than for tillering. The K content in mature leaves for a high number of grains should not drop below 2% K at the booting stage (Kiuchi and Ishizaka ,1961).

Conclusion

The grain and straw yields, dry matter production and the nutrient uptake (N, P, K) were significantly higher in the treatments received combined application of 100% potassium through MOP along with SOP applied through sprays over the control plots

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