

## Effect of Different Methods of Potassium Application on Boro Paddy at Red and Lateritic Zones of West Bengal

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**Abstract** A field experiment was conducted at RRS, Jhargram, BCKV during boro 2014 to study the effect of different methods of potassic fertilizer application on yield of boro paddy. The experiment was conducted in a randomized complete block design with four replications. Plant height at different days, tillers per heel, grain yield, straw yield, test weight were recorded. Foliar application of KCl along with soil application significantly influenced the yield components. The treatments were T<sub>1</sub>-Soil application of KCl@45kg/ha along with 22.5 kg/ha during second top dressing, T<sub>2</sub>-Soil application of KCl@22.5 kg/ha at basal, first and second top dressing respectively, T<sub>3</sub>-Soil application of KCl@45kg/ha along with two nos. foliar application of KCl @ 1% during second top dressing at seven days interval, T<sub>4</sub>-Soil application of KCl@45kg/ha along with two nos foliar application of KCl @ 1% at 7 days intervals during first and second top dressing, T<sub>5</sub>-Soil application of KCl @ 45kg/ha at basal along

with foliar spray of KCl @ 1% during both first and second top dressing, T<sub>6</sub>-Soil application of KCl @ 65 kg/ha. Among all the treatments, two number foliar application of KCl @ 1% at 7 days interval during second top dressing including basal application of 45 kg KCl/ ha significantly out yielded the rest of the treatments, highest grain yield was recorded with this treatments. Plant height at 45 DAS, 70 DAS, number of active tiller per heel, test weight of grain, straw yield were influenced by foliar application along with basal application of potassium. This experiment suggested that foliar application of KCl @ 1% at seven days intervals during second top dressing along with basal application of KCl could produce better result in rice production than only soil application.

**Keywords** Foliar application, KCl, Paddy yield.

### Introduction

Rice is a staple food for more than 50% of world population. World's food security largely depends upon rice production. During 2014-15 total rice production in India was 103.04m. ton [1]. During 2013-14 world production of rice has increased by 1% where as consumption has increased by 3%, but area

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under rice cultivation has not increased significantly during the recent years. China is the leading producer of rice followed by Indonesia and Bangladesh in 2013-14. But India is the largest exporter of rice in 2013-14 followed by Thailand, Vietnam, Usa. Rice is produced by using the minimum traditional cropping technique, therefore fertilizer imbalance occurs very often. Among the essential plant nutrients supplied to the rice plant, potassium plays important role in different physiological processes of plant [2]. As a source of  $K_2O$ , MOP (KCl) is generally used both in basal as well as in foliar spray specially in acidic soil, as potassium sulfate is mostly used as a source in alkaline soil [3]. When KCl is used, it not only adds  $K_2O$  but also chloride ion to plant and soil. Due to intensive cropping intensity and rapid plant growth, potassium deficiency occurs as the plant root can not absorb sufficient amount of  $K_2O$  from soil. In a soil where water holding capacity is less, moisture stress condition may occur during dry spell or in between application of two irrigation. Under this situation, foliar application of potassium plays important role in osmotic regulation of leaf. Due to climate change, more urbanization, vagaries of monsoon, depletion of ground under water table the rice growing areas in India are decreasing day by day. At the same time population increase also augments the problem of food security. Now it becomes a great challenge for the farmers as well as for the agricultural scientist to sustain and increase rice production in India.

### Materials and Methods

A field experiment was carried out at Regional Research station of Bidhan Chandra Krishi Viswavidyala at Jhargram of West Midnapur District during boro 2014 to study the effect on different methods of potassic fertilizer application on paddy. The experimental area is under red and lateritic agro climatic zone with predominant sandy loam soil, water holding capacity of soil is low and the soil is acidic in nature. The annual rainfall is around 1200 mm with fluctuating distribution. The experiment was laid out in RBD with four replications. The plot size was 5mt  $\times$  4mt. The seed for raising seedling was sown on 2<sup>nd</sup> week of december and transplanting of seedlings was done on last week of January.

**Table 1.** Effect of soil and foliar application of potassium on plant height, active tiller/heel.

Treatments	Plant height at 45 DAS (30 cm)	Plant height at 75 DAS (30 cm)	Plant height at 120 DAS (30 cm)	Active tiller/heel
T <sub>1</sub>	43.33	84.67	126.00	14.00
T <sub>2</sub>	45.33	82.67	125.50	13.33
T <sub>3</sub>	48.67	86.00	126.33	16.33
T <sub>4</sub>	46.33	82.33	126.17	13.67
T <sub>5</sub>	44.00	77.0	126.50	13.00
T <sub>6</sub>	40.67	74.0	126.15	11.33
CD (5%)	4.165	10.0	NS	2.416

Row to row and plant to plant distance was maintained at 20 cm. The treatments were as follows T<sub>1</sub>- Soil application of KCl @ 45kg/ha along with 22.5 kg/ha during second top dressing, T<sub>2</sub>-Soil application of KCl @ 22.5 kg/ha basal, first and second top dressing respectively, T<sub>3</sub>-Soil application of KCl @ 45 kg/ha along with two nos. foliar application of KCl @ 1% during second top dressing at seven days interval, T<sub>4</sub> -Soil application of KCl @ 45 kg/ha along with two nos. foliar application of KCl @ 1% at 7 days intervals during first and second top dressing, T<sub>5</sub>-Soil application of KCl @ 45 kg/ha at basal along with foliar spray of KCl @ 1% during both first and second top dressing, T<sub>6</sub>-Soil application of KCl @ 65kg/ha. Nitrogen and phosphorus was applied @ 100kg and 50kg/ha respectively. 1/4<sup>th</sup> N and full dose of P<sub>2</sub>O<sub>5</sub> were applied as basal, rest 1/2 N and 1/4<sup>th</sup> N were applied at 1<sup>st</sup> and 2<sup>nd</sup> top dressing respectively. Data for plant height at 45 DAS (days after sowing), 75 DAS and 120 DAS, no.of active tiller per heel, grain yield, straw yield, test weight, harvest index were recorded. Five plants from each plot were randomly selected to record the observations like plant height, tiller per heel, test weight.

### Results and Discussion

#### Plant height

Foliar application of KCl along with soil application significantly affected the plant height (Table 1). The range of plant height was 40.67 to 48.67 cm at 45 DAS and 74 to 86 cm at 75 DAS . However plant

Table 2. Effect of soil and foliar application of potassium on test weight, grain yield, straw yield & harvest index.

Treatments	Test Wt (g)	Grain yield/ha (ton)	Straw yield/ha (ton)	HI
T <sub>1</sub>	15.30	3.40	10.467	24.51
T <sub>2</sub>	15.23	3.30	10.133	24.56
T <sub>3</sub>	15.73	3.90	11.733	24.95
T <sub>4</sub>	15.56	3.63	10.767	25.22
T <sub>5</sub>	15.30	3.43	10.467	24.70
T <sub>6</sub>	14.80	3.16	10.00	24.15
CD(5%)	0.375	0.295	1.059	NS

height at maturity was not significantly influenced by foliar application along with soil application of KCl. Highest plant height (126.5 cm) at maturity was obtained at T<sub>5</sub> treatment [4].

#### Number of active tiller per heel

Number of active tillers per heel were significantly affected by the method of application of potassic fertilizer (Table 1). However highest no. of productive tillers/heel was found at treatment no. 3 i.e. soil application of KCl @ 45 kh/ha at basal along with foliar application of KCl of 1 % at two split dose at seven days intervals during second top dressing. Minimum no.of productive tillers/heel was found at T<sub>6</sub> where all the potassic fertilizer was applied at basal and it was statistically at par with treatment T<sub>2</sub>, T<sub>4</sub>, T<sub>5</sub> [5, 4].

#### Test weight of grain

Both soil application of KCl at split dose and soil application along with foliar application of KCl significantly influenced the 1,000 grain weight over soil application of KCl at basal i.e. no top dressing of kcl. T<sub>3</sub> treatment gave the highest 1, 000 grain weight. However 1,000 grain weight from T<sub>5</sub> treatment was statistically at par with treatment T<sub>1</sub>. The test weight of grain in treatment T<sub>1</sub> and T<sub>2</sub> T<sub>3</sub> and T<sub>4</sub> and T<sub>5</sub> was statistically at par. The effect of foliar application of potassic fertilizer over soil application on 1,000 grain weight was also reflected in the earlier findings [ 6,7].

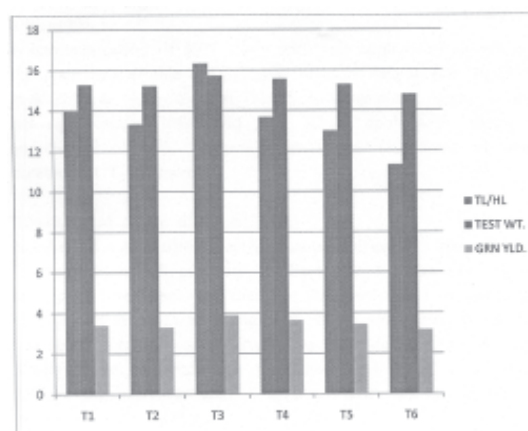


Fig. 1. Relation between different potassium treatments and no. active tiller/heel, test wt of grain (g), grain yield (ton/ha).

#### Grain yield

T<sub>3</sub> treatment gave highest paddy yield i.e.3.9 ton/ha followed . Minimum grain yield was recorded at T<sub>6</sub> treatment where no foliar application of KCl was done. So foliar application of KCl along with soil application may increase the paddy yield over soil application alone to the tune of 23.41%. The increase in grain yield due to foliar application and soil application over soil application alone was due to better effective tiller/heel, test weight. This result reflected an earlier report [8] where he found increase in grain yield with foliar application of KCl.

#### Straw yield

Straw yield was significantly affected by foliar application along with soil application of KCl in comparison to only soil application of KCl. Maximum straw yield was obtained in the order from T<sub>3</sub> treatment. However straw yield from treatment no.5 i.e. T<sub>5</sub> and T<sub>1</sub> was statistically at per.

#### Harvest index

However application of KCl either soil alone or in combination with foliar application had failed to have

significant effect on harvest index (HI) (Table 2). Highest HI was obtained from treatment T<sub>4</sub> followed by T<sub>3</sub>, T<sub>5</sub>, T<sub>2</sub>, T<sub>1</sub>, T<sub>6</sub>.

### Conclusion

It can be concluded from the study that foliar application of KCl @ 1% during top dressing along with basal application (2/3 quantity of total) gave better result in grain production of paddy in comparison to soil application of KCl either in basal or basal with top dressing. The increase in grain yield is due to better test weight of grain, no. of productive tiller/heel. As the soil is acidic in nature so the presence of ferrus (Fe) ion retards the potassium uptake by rice plant from soli, beside this the water holding capacity of experimental plot is low, under this situation foliar application of KCl during top dressing period may attribute to better grain weight which in turn give more grain yield. Besides this rice plant absorbs 55—60% of its total K uptake from seed germination to early jointing stage, so foliar application during second top dressing may have better impact on increased grain yield.

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