*Available online at* www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.6123

**ISSN: 2320 – 7051**

*Int. J. Pure App. Biosci.* **7 (2):** 364-367 (2019)

International Journal of Pure & Applied Bioscience

*Research Article*

OPEN ACCESS

# Effect of Fertilizer Levels and Different Combinations of Biofertilizers on Potassium Content & Uptake and Soil Nutrient Status

**Priti Malik*, Meena Sewhag, Karmal Malik, Praveen Kumar and Shweta**

Department of Agronomy, CCS Haryana Agricultural University, Hisar- 125004 (Haryana), India

*Corresponding Author E-mail: priti.malikhau@gmail.com

Received: 10.11.2017 | Revised: 14.12.2017 | Accepted: 22.12.2017

**ABSTRACT**

*The experiment was conducted during Rabi 2015-16 and 2016-17 at Research Area of Agonomy, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana (India) situated at 29°10' N latitude and 75° 46' E longitude at an elevation of 215.2 m above mean sea level to notice the effect of fertilizer levels and different combinations of biofertilizers on potassium content & uptake and nutrient status of soil. Various RDF levels (50%, 75% and 100%) and different combinations of biofertilizers (uninoculated, Azotobacter, Azospirillum, PSB, biomix, Azotobacter + PSB and Azospirillum +PSB) were used as treatments. There was no significant influence of various fertilizer levels on K content in grain and straw of barley. Whereas significant effect was observed during both the years of experimentation on K uptake by grain and straw. Significantly higher K uptake by grain and straw were recorded with the application of 100 % RDF than rest two treatments. Seed inoculation with biomix recorded significantly higher K uptake by grain of barley as compared to rest of the treatments during both the years of experimentation. Nutrient content of soil did not differ significantly before planting of barley crop during both the years of experimentation. There was also no significant difference resulted due to application of different fertility levels and different combinations of biofertilizers on N, P, K status of soil after harvesting of crop during both the years of experimentation.*

***Key words:*** *Fertilizer levels, Biofertilizers, Biomix, Nutrient content and K uptake*

## INTRODUCTION

Barley (*Hordeum vulgare*) belongs to grass family (poaceae). It is a major cereal crop grown in temperate climate worldwide. Barley was one of the 1st cultivated crops, especially in Eurasia 10,000 years ago. It is used as fodder for animals, source of fermentable material for production of beer and various distilled beverages and also as a component of different health foods. It is widely used in stews and soups, also in barley bread under various cultures. Barley grains commonly converted into malt in a very traditional method of preparation. The old english word for barley was *bære*, which traces back to the Proto-Indo-European and is cognate to the Latin word *farina* that means flour.

**Cite this article:** Malik, P., Sewhag, M., Malik, K., Kumar, P. and Shweta, Effect of Fertilizer Levels and Different Combinations of Biofertilizers on Potassium Content & Uptake and Soil Nutrient Status, *Int. J. Pure App. Biosci.* **7(2):** 364-367 (2019). doi: http://dx.doi.org/10.18782/2320-7051.6123

The ancestor of modern English word barley in Old English was the derived adjective *bærlic*, meaning "of barley". Barley is a self pollinating crop. It is a diploid species with 14 chromosomes. In year of 2016, world barley production was 141 million tonnes. It is a widely adaptable crop. Barley crop is currently very popular in temperate areas where it is grown as a summer crop and in case of tropical areas it is grown as a winter crop. Its germination time is from 1 to 3 days. Barley grows well under the cool conditions, but is not a particularly winter hardy crop.

It is more tolerant for soil salinity than the wheat. In a 100g serving, barley provides 352 Calories and it is also a rich source of essential nutrients in our food which includes protein, B vitamins, dietary fiber, niacin and vitamin $B_6$ and several other dietary minerals. Maximum nutrient contents are for the manganese and phosphorus. Barley contains 78% carbohydrates, 1% fat, 10% protein and also 10% water in it. Now a days biofertilizers are becoming more popular as combined with chemical fertilizers to reduce the dose of chemical fertilizers so that the negative effect of these fertilizers can be reduced on the soil as well as environment. Keeping these points under the consideration, present investigation was taken on "Effect of fertilizer levels and different combinations of biofertilizers on potassium content & uptake and soil nutrient status".

## MATERIAL AND METHODS

The field experiment was conducted during *rabi* season of 2015-16 and 2016-17 which was replicated thrice having the split plot design at Research Area of Agronomy, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana (India) which is situated at 29°10' N latitude and 75° 46' E longitude at an elevation of 215.2 m above the mean sea level. Treatments taken as in the main plots were fertilizer levels as 50 % RDF, 75 % RDF and 100 % RDF and in sub plot were uninoculated, *Azotobacter*, *Azospirillum*, PSB, *biomix* i.e *Azotobacter* +*Azospirillum*+PSB, *Azotobacter*+PSB and *Azospirillum* +PSB in a split plot design.

K content in grain as well as straw at harvest was determined. For analysis of K oven dried plant material (grain as well as straw at harvest) from each plot was grinded separately with the help of grinder. Potassium[1] contents in sample were analyzed.

The uptake of nutrient was computed as:

$$\text{Nutrient uptake by grain (kg/ha)} = \frac{\text{Nutrient content in grain (\%) x Grain yield (kg/ha)}}{100}$$

$$\text{Nutrient uptake by straw (kg/ha)} = \frac{\text{Nutrient content in straw (\%) × Straw yield (kg/ha)}}{100}$$

The composite soil samples from 0-15 cm of the depth were analyzed before sowing the crop and after harvesting for determining the available nitrogen, phosphorus and potassium.

## RESULTS AND DISCUSSION

A close perusal of the data in table 1 on N, P, K status of soil revealed that available nutrient of soil did not differ significantly before planting of barley crop during both the years of experimentation. There was also no significant difference resulted due to application of different fertility levels and different combinations of biofertilizers on N, P, K status of soil after harvesting of crop during both the years of experimentation.

**Table 1: Effect of fertilizer levels and different combinations of biofertilizers on soil nutrient status**

| Treatments | 2015-16 | | | | | | 2016-17 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | N (kg/ha) | | $P_2O_5$ (kg/ha) | | $K_2O$ (kg/ha) | | N (kg/ha) | | $P_2O_5$ (kg/ha) | | $K_2O$ (kg/ha) | |
| | Before | After | Before | After | Before | After | Before | After | Before | After | Before | After |
| **Fertilizer levels** | | | | | | | | | | | | |
| 50 % RDF | 133.58 | 123.69 | 15.71 | 13.95 | 388.18 | 317.31 | 135.46 | 125.21 | 16.63 | 14.97 | 388.60 | 318.36 |
| 75 % RDF | 133.78 | 121.65 | 16.00 | 14.26 | 384.27 | 318.50 | 134.74 | 124.23 | 16.86 | 15.27 | 386.53 | 320.50 |
| 100 % RDF | 128.96 | 122.99 | 15.80 | 14.31 | 386.06 | 318.48 | 136.76 | 123.59 | 16.70 | 15.32 | 387.14 | 318.39 |
| SEm± | 0.32 | 0.26 | 0.35 | 0.44 | 0.41 | 0.29 | 0.19 | 0.14 | 0.22 | 0.31 | 0.36 | 0.27 |
| CD at 5 % | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |
| **Biofertilizers** | | | | | | | | | | | | |
| Uninoculated | 134.09 | 122.46 | 15.94 | 14.13 | 387.35 | 318.34 | 135.97 | 123.96 | 16.77 | 15.12 | 388.58 | 319.35 |
| *Azotobacter* | 133.86 | 123.63 | 16.08 | 14.41 | 386.19 | 317.40 | 135.74 | 124.16 | 16.91 | 15.16 | 387.48 | 318.03 |
| *Azospirillum* | 122.33 | 120.01 | 15.75 | 14.16 | 385.41 | 317.87 | 135.53 | 124.59 | 16.70 | 15.15 | 387.11 | 318.98 |
| *PSB* | 133.72 | 123.05 | 15.62 | 14.15 | 385.36 | 318.48 | 135.57 | 124.66 | 16.54 | 15.19 | 386.64 | 319.36 |
| *Biomix* | 133.37 | 123.13 | 15.83 | 14.14 | 387.37 | 317.59 | 135.22 | 124.68 | 16.74 | 15.17 | 388.58 | 318.68 |
| *Azotobacter + PSB* | 133.55 | 123.34 | 15.86 | 14.07 | 385.80 | 318.34 | 135.76 | 123.98 | 16.76 | 15.28 | 387.01 | 319.44 |
| *Azospirillum +PSB* | 133.84 | 123.84 | 15.74 | 14.13 | 385.71 | 318.66 | 135.79 | 124.39 | 16.71 | 15.24 | 386.56 | 319.76 |
| SEm± | 0.24 | 0.39 | 0.45 | 0.43 | 0.34 | 0.45 | 0.25 | 0.21 | 0.18 | 0.28 | 0.26 | 0.42 |
| CD at 5 % | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS | NS |

The data pertaining K content and uptake by grain and straw of barley are presented in Table 2. A perusal data showed that during both the years of experimentation there was no significant influence of various fertilizer levels on K content in grain and straw of barley. Whereas significant effect was observed during both the years of experimentation on K uptake by grain and straw. Significantly higher K uptake by grain and straw were recorded with the application of 100 % RDF than rest two treatments.

There was also no significant effect of various combinations of biofertilizers inoculation on K content in grain and straw of barley during both the years of experimentation. But, seed inoculation with *Biomix* recorded significantly higher K uptake by grain of barley as compared to rest of the treatments during both the years of experimentation. However, the difference in K uptake by grain in seed inoculation with *Biomix* and *PSB* alone were not significant in the year 2015-16. Similarily the difference in K uptake by grain in seed inoculation with *Biomix* and *Azospirillum +PSB* were not significant in the year 2016-17. Seed inoculation with *Biomix* recorded significantly higher K uptake by straw of barley as compared to rest of the treatments during both the years of experimentation. However, the differences in K uptake by straw in seed inoculation with *Biomix* and *Azospirillum +PSB* were not significant in the year 2015-16.

**Table 2: Effect of fertilizer levels and different combinations of biofertilizers on potassium content and uptake by grain and straw of barley**

| Treatments | 2015-16 | | | | 2016-17 | | | |
|---|---|---|---|---|---|---|---|---|
| | K content (%) | | K uptake (kg/ha) | | K content (%) | | K uptake (kg/ha) | |
| | Grain | Straw | Grain | Straw | Grain | Straw | Grain | Straw |
| **Fertilizer levels** | | | | | | | | |
| 50 per cent RDF | 0.48 | 1.55 | 15.41 | 82.61 | 0.49 | 1.56 | 19.72 | 104.21 |
| 75 per cent RDF | 0.49 | 1.55 | 16.66 | 88.29 | 0.50 | 1.56 | 21.49 | 111.05 |
| 100 per cent RDF | 0.49 | 1.56 | 18.78 | 100.97 | 0.50 | 1.57 | 24.02 | 126.51 |
| SEm± | 0.04 | 0.07 | 0.31 | 1.38 | 0.02 | 0.02 | 0.7 | 2.23 |
| CD at 5 % | NS | NS | 0.96 | 4.34 | NS | NS | 2.23 | 6.74 |
| **Biofertilizers** | | | | | | | | |
| Uninoculated | 0.48 | 1.55 | 15.19 | 81.37 | 0.49 | 1.56 | 20.05 | 101.70 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Seed inoculation with *Azotobacter* | 0.48 | 1.54 | 16.81 | 86.18 | 0.49 | 1.55 | 21.35 | 108.57 |
| Seed inoculation with *Azospirillum* | 0.48 | 1.55 | 17.11 | 88.49 | 0.50 | 1.56 | 21.61 | 109.34 |
| Seed inoculation with *PSB* | 0.49 | 1.55 | 17.48 | 88.40 | 0.50 | 1.56 | 21.74 | 110.97 |
| Seed inoculation with *Biomix* | 0.49 | 1.57 | 18.03 | 99.53 | 0.50 | 1.58 | 23.33 | 126.61 |
| Seed inoculation with *Azotobacter + PSB* | 0.49 | 1.55 | 16.88 | 94.17 | 0.49 | 1.56 | 21.92 | 119.40 |
| Seed inoculation with *Azospirillum +PSB* | 0.49 | 1.56 | 17.16 | 96.22 | 0.50 | 1.57 | 22.19 | 120.84 |
| SEm± | 0.06 | 0.07 | 0.23 | 1.44 | 0.03 | 0.01 | 0.41 | 1.79 |
| CD at 5 % | NS | NS | 0.75 | 4.41 | NS | NS | 1.22 | 5.42 |

The increase in uptake of nutrient was mainly due to the fact that nutrient uptake followed the yield pattern which increased with increasing level of fertilization. Katiyar and Uttam[2] reported that the higher fertility levels increased the concentration and uptake of K in grains and straw. According to Kumar[3] highest potassium uptake in grain was observed by the application of 125% of recommended dose of nitrogen and also highest potassium uptake by stover is obtained by this treatment. Due to the application of high level of fertilizers, more nutrients availability might have increased the cation exchange capacity of roots thereby increasing the nutrient absorption and cellular contents in plants[4]. Similar results K uptake were reported by[5]. Sayed *et al.*[6], also reported that *Azosprillum* inoculation alone or in combination with *phosphate solubilizing bacteria* significantly increased K uptake.

## CONCLUSION

Based on two years study, it can be concluded that application of 100 % RDF in barley was found optimum in terms of K uptake by grain and straw. There was no significant influence of various fertilizer levels on NPK status of soil and K content in grain and straw of barley. Among different combinations of biofertilizers, seed inoculation with *Biomix* was found better in respect of K uptake by grain of barley.

## REFERENCES

1. Richards, L.A., Diagnosis and improvement of saline and alkali soils, *USDA Hand Book*, United State Salinity Laboratory. **60** (1954).
2. Katiyar, A.K. and Uttam, S.K., Effect of fertility levels & weed control practices on nutrient uptake & yield of rainfed barely in eroded soil of central Uttar Pradesh, *Indian Agriculturalist*. **52(1&2):** 17-21 (2003).
3. Kumar, P., Effect of different nitrogen levels and biofertilizers strains on productivity and soil fertility in pearlmillet-wheat cropping system. PhD thesis, Chaudhary Charan Singh Haryana Agricultural University, Hisar, Haryana (2005).
4. Kumar, M., Singh, H., Hooda, R.S., Khippal, A.K., Singh, T. and Sheoran, P., Effect of genotypes and nitrogen levels on N, P and K content and uptake by irrigated pearl millet [*Pennisetum glaucum* (*L.*) *R.Br. Emend Stuntz.*], *Research Crops*. **3(3):** 493-497 (2002).
5. Ram, M., Davari, M.R. and Sharma, S.N., Direct, residual & cumulative effects of organic manures & biofertilizers on yields, NPK uptake, grain quality & economics of wheat (*Triticum aestivum L.*) under organic farming of rice-wheat cropping system, *Journal of Organic Systems.* **9(1):** 16-30 (2014).
6. Sayed, A.A., Elenein, R.A., Shalaby, E.E., Shalan, M.A. and Said, M.A., Response of barley to biofertilizer with N & P application under newly reclaimed areas in Egypt, *Third International Crop Science Congress, Abstracts*. 169-175 (2000).