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Effect of different levels of N and P fertilizers with biofertilizers on yield and nutrient uptake by chilli (*Capsicum annum* L.) in lateritic soils of Konkan

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Abstract
An investigation entitled "Effect of different levels of N and P fertilizers with biofertilizers on yield, biochemical parameters, soil properties and nutrient uptake by chilli (*Capsicum annum* L.), in lateritic soils of Konkan" was undertaken during *Rabi* season of 2016-2018 years at the Research Farm of the Department of Agronomy, College of Agriculture, Dapoli, and Dist. Ratnagiri, Maharashtra.. The effect of different levels of N and P fertilizers with biofertilizers on yield, biochemical parameters, soil properties and nutrient uptake by chilli at different growth stages was studied. The field experiment was laid out in the factorial strip plot design, comprising of thirty six treatments replicated three times, comprising of three levels of nitrogen viz. No- $N_{0\%}$ (0 kg N ha^{-1}), N_1- $N_{75\%}$ (112.5 kg N ha^{-1}) and N_2- $N_{100\%}$ (150 kg N ha^{-1}) three levels of phosphorus viz. P_0- $P_{0\%}$(0 kg P_2O_5 ha^{-1}), P_1 - $P_{75\%}$ (37.5 kg P_2O_5 ha^{-1}) and P_2 - $P_{100\%}$(50 kg P_2O_5 ha-1) and four sources of bio fertilizers viz. No biofertilizer (B_0), N fixer- *Azotobacter chroococcum* (B_1), P solubilizer- *Aspergillus niger* (B_2) and N fixer + P solubilizer (B_3), with potassium @ 50 kg ha^{-1} and FYM @ 15 t ha^{-1} was applied to all the treatments. The effect of recommended doses of nitrogen and phosphorous with dual inoculation of biofertilizers increased the plant height, dry matter production, green pod yield over no application of fertilizers. Whereas uptake of major as well as micronutrients were increased due to application of recommended dose of N and P fertilizers with inoculation of both biofertilizers.

Keywords: biofertilizers, nitrogenous and phosphatic fertilizers, growth, yield, nutrients uptake, chilli

Introduction
The production and productivity of the crop are far below in our country due to lack of proper management practices. Among which proper nutrition is one of the causes. The ever increasing cost of nitrogenous fertilizers have emphasized the need of full exploitation of biological nitrogen fixation. The biofertilizers have come to known as low cost inputs in agriculture which gives higher returns under favourable condition. Chilli (Capsicum annum .L) popularly known as "King of spice "is one of the important commercial crops in India. It belongs to the family Solanaceae, genus Capsicum annum and Capsicum frutescent. It is cultivated in almost all Indian states. India contributes one fourth of the world's production of chilli and is mainly grown in Andhra Pradesh, Karnataka, Tamil Nadu, and Orissa. Area under Chilli during the year 2011-12 in India was 805,000 ha, productivity was 1.6 MT/ha.Chilli occupies 102.9 thousand hectors area in Maharashtra and produces 48.1 thousand tonnes per annum (Annonymous, 2014) [1]. Chilli fruits are excellent source of Vit. A and C. The pungency in chilli is due to the Alkaloid 'Capsaicinoid'. It has been proved that indiscriminate use of inorganic fertilizers results in decrease in soil fertility and increase in soil acidity with depletion of organic humus content in addition to poor crop quality. Use of organic manures to meet the nutrient requirements of crop would be an inevitable practice in the years to come for sustainable agriculture since organic manure not only improve the soil physical, chemical and biological properties but also improves the moisture holding, thus resulting in enhanced crop productivity along with better quality of crop produce. At the same time, the cost of chemical fertilizers is also increasing day by day hence, adoption of integrated plant nutrient offers scope for sustainable crop production and improves soil fertility.

Nowadays, there is essentiality of integrated production and protection technology for enhancing the quality as well as production of crops and to reduce the cost of production. So along with high production of crops, good quality is also required to fetch high price and to ensure the supply of crops. Although organic manures contain several nutrients in lower concentration as compared to fertilizers, organic matter promotes microbial process in soil, improves soil structure, aeration and water holding capacity. It has a regulating effect on soil temperature, minimizes the fixation of nutrients and supplies decomposed products which helps for the growth of plants. The yearly application of organic manures and biofertilizers in conjunction with NPK fertilizers has a pronounced effect in enhancing the efficiency of chemical fertilizers. This has also led to improve crop productivity by 16 – 44 percent in various soil groups (Thakur *et al*. 2012) [7]. To overcome the deficit in nutrient supply and to overcome the adverse effects of fertilizers it is suggested that efforts should be made to exploit all the available resources of nutrients under the theme of integrated nutrient management. Keeping these views in mind, a study the effect of nitrogenous and phosphatic fertilizers levels with biofertilizers on growth , yield and nutrient content of chilli.

Material and Methods

The field trials were conducted at Research Farm of the Department of Agronomy, College of Agriculture, Dapoli during two successive *Rabi* seasons of the years between 2016-17 and 2017-18 The field experiment was laid out in the factorial strip plot design, comprising of thirty six treatments replicated three times, comprising of three levels of nitrogen viz. $N_{0\%}$ -0 kg N ha^{-1} (N_0), $N_{75\%}$- 112.5 kg kg N ha^{-1} (N_1) and $N_{100\%}$ 150 kg N ha^{-1} (N_2), three levels of phosphorus viz. $P_{0\%}$- 0 kg P_2O_5 ha^{-1} (P_0), $P_{75\%}$- 37.5 kg P_2O_5 ha^{-1}(P_1) and $P_{100\%}$- 50 kg P_2O_5 ha^{-1} (P_2)and four sources of bio fertilizers viz. No biofertilizer (B_0), N fixer- *Azotobacter chroococcum* (B_1), P solubilizer- *Aspergillus niger* (B_2) and N fixer + P solubilizer (B_3), with potassium @ 50 kg ha^{-1} and FYM @ 15 t ha^{-1} was applied to all the treatments.

The microbial culture was obtained from Department of Pathology, Dr. B.S.K.K.V. Dapoli. The cultures of *Azotobacter chroococcum* and *Aspergillus niger* were prepared separately in water @ 250 g / 3 liter each and one was prepared by mixing both cultures in water @ 250 g / 3 liter. The chilli seedlings were dipped for a period of 30 minutes in the slurry and then used for transplanting according to the respective treatment. Treatment wise quantity of manure and fertilizers applied before and after transplanting of chilli seedlings Thirty days old seedling were transplanted at a distance of 45 cm x 30 cm.

One seedling was transplanted per hill. The recommended fertilizer dose was 15 ton FYM 150 kg N + 50 kg P_2O_5 + 50 kg K_2O per hectare. Nitrogen was applied in three splits, 50% N was applied as basal while 25% N was applied thirty days after transplanting of a crop and 25% N was applied 60 days after transplanting.

The phosphorus and potassium were applied as basal dose before transplanting of a crop. The respective doses of N and P fertilizers and a common dose of K fertilizer were applied in band before transplanting of chilli seedlings. The remaining fifty percent of the N dose was used for top dressing and was applied by *Ring* method.

Result and Discussion

Yield parameters of chilli

Effect of Nitrogen and Phosphorus levels with biofertilizers on the green and dry pod yield of chilli obtained during the years 2016-17 and 2017-18 are given in Table 1. The yield parameters are discussed as follows.

Green pod yield

The data on green pod yield of chilli as influenced by various levels of N and P fertilizers with and without biofertilizers is presented in Table 1. The data revealed that application of 112.5 kg N ha^{-1} and 150 kg N ha^{-1} significantly increased the green pod yield 97.27 q ha^{-1} and 89.40 q ha^{-1}, respectively over a treatment receiving no nitrogen during the year 2016-17. While during the second year, application of 112.5 kg N ha^{-1} and 150 kg N ha^{-1} resulted in significant increase in green pod yield by 96.57 q ha^{-1} and 87.80 q ha^{-1}, respectively over a treatment receiving no nitrogenous fertilizers. The effect of phosphorus on increasing the green pod yield of chilli was also found to be significant as incorporation of phosphatic fertilizer @ 37.5 Kg P_2O_5 ha^{-1} and 50 Kg P_2O_5 ha^{-1} increased the green pod yield of chilli by 96.03 q ha^{-1} and 87.50 q ha^{-1}, respectively over a treatment receiving no phosphrous during the first year of study, while during the second year, application of 37.5 kg and 50.0 kg P_2O_5 ha^{-1} resulted into significant increase in green pod yield by 94.02 q ha^{-1} and 85.93 q ha^{-1}, respectively. As regards to the effect of biofertilizers, inoculation of N-fixer, P solubilizer and N fixer and P solubilizer resulted in significant increase in green pod yield to 92.08 q ha^{-1}, 88.15 q ha^{-1} and 84.81 q ha^{-1}, respectively over a treatment without any biofertilizers during the first year of study. Similarly, during the second year of study also, inoculation of said microbial cultures resulted in significant increase in green pod yield of chilli to 90.59 q ha^{-1}, 85.56 q ha^{-1} and 83.53 q ha^{-1}, respectively over a treatment receiving no biofertilizer. Maximum green pod yield was obtained due to the inoculation of both the biofertilizers (B_3) and this treatment is significantly superior over other two biofertilizers applied alone (B_1 and B_2) showing the importance of both types of biofertilizers in the elevation of green pod yield of chilli.

The data presented in Table 2, regarding the effect of N and P fertilizer levels on the green pod yield revealed that the application of combined levels of N and P fertilizers was significant during both the years. Maximum green pod yield of 112.02 and 110.25 q ha^{-1} was obtained in the treatment N_2P_2 receiving maximum dose of N and P fertilizers during first and second years, respectively. The said treatment resulted in significant increase in green pod yield by 19.81 q ha^{-1} and 20.35 q ha^{-1} over a treatment receiving 75% doses of N and P fertilizers (N_1P_1), respectively. The green pod yield of chilli was significantly influenced owing to application of different levels of nitrogen and biofertilizers. Maximum green pod yield of 104.53 q ha^{-1} and 103.52 q ha^{-1} during first and second years, respectively was obtained in the treatment N_2B_3 having recommended dose of N and both types of biofertilizers. This treatment is significantly superior over rest of the treatments having different levels of N and different types of biofertilizers. The effect of phosphorus levels and types of biofertilizers on green pod yield of chilli was significant only during the year 2016-17. The treatment P_2B_3 produced maximum green pod yield to the tune of 103.42 q ha^{-1} during 2016-17, which is significantly superior over rest of the treatment combinations comprising three levels of P and 3 types of biofertilizers. At recommended dose of fertilizer phosphorus, the N- fixer and P solubilizer produced identical yield of 98.29 and 98.62 q ha^{-1}, respectively showing both the treatments are at par with each other. At 75% recommended dose of P fertilizer also the differences in green pod yield between these two biofertilizers were not significant. This showed equal behaviour of these two organisms in respect of green pod yield of chilli. At all the levels of N and P fertilizers combinations, green pod yield is

increased significantly due to application of P solubilizer and N fixer + P solubilizer biofertilizers over the respective treatments of N and P fertilizers without any biofertilizers. Except in the treatment N_0P_2, the behaviour of P solubilizer and two biofertilizers was same in respect of the green pod yield.
In the year 2017-18, inoculation of three types of biofertilizers resulted in significant increase in green pod yield over a treatment receiving no biofertilizers in all the treatments of N and P combination except in $N_0P_1B_0$ treatment. Thus, biofertilizers helped in increasing green pod yield of chilli when applied in combination with N and P fertilizers. The fruit yield is the manifestation of various growth and yield attributing characters and the higher yield could be traced back to significant differences in dry matter production and its accumulation. The higher accumulation of assimilates reflected in higher number of fruits per plant, fruit length, fruit weight and ultimately the yield. Similar findings were reported by Kokare (2013) [4] and Kapse et al. (2017) [3]. Phosphate solubilization, PSB inoculation with *Azotobacter* might have also favoured the P availability in soil resulting in better crop growth. Further, the production of amino acid, vitamins and growth promoting substances by *Azotobactor* and PSB might have resulted in improving plant growth and yield attributes of chilli. An experiment an effect of different levels of nitrogen *viz.* 0, 30, 60 and 0 kg ha^{-1} with a common dose of 30 kg K ha^{-1} was studied on growth parameters by Naeem *et al.* (2002) [5]. Maximum number of branches per plant (10) plant height (98) and number of fruits per plant (52) were registered in plots fertilizer with 90-60-30 kg NPK per hectare

Dry pod yield

The dry pod yield of chilli received during two consecutive *Rabi* seasons as influenced by the effect of different levels of N and P fertilizers with and without biofertilizers are given in Table 1. From the data it is evident that dry pod yield of chilli is significantly increased by 9.87 q ha^{-1} and 9.22 q ha^{-1} due to application of 112.5 kg and 150 kg N ha^{-1}, respectively over the treatment receiving no N fertilizers. The same was the case during the second year of study. Dry pod yield increased by 11.11 q ha^{-1} and 9.97 q ha^{-1}, receptively over no nitrogen application. Maximum dry pod yield was secured with the recommended dose of fertilizer.
As regards to levels of phosphorus, recommended dose of phosphorus produced an increase in yield to 96.03 q ha^{-1}. This treatment was statistically significant. During the second year of study, the increase in dry pod yield produced was to 10.69 q ha^{-1} in the same treatment.
Maximum dry pod yield of chilli to the tune of 9.42 and 10.27 q ha^{-1} was produced due to inoculation of N fixer and P solubilizer, which was significantly higher over the treatments receiving N fixer alone and P solubilizer alone during the years 2016-17 and 2017-18, respectively. The differences in dry pod yield between the treatments receiving both the biofertilizers and single biofertilizer either N fixer or P solubilizer were statistically significant during both the years. This proved that both the biofertilizers assisted in promoting the dry pod yield.
Uddin *et al.* (2003) [8] studied yield attributes of chilli as influenced by 0, 20, 40, 60, 80, 100, 120 and 140 kg N ha^{-1}. The highest dry fruit weight per plant was produced from 120 kg N ha^{-1} and thereafter it was declined with 140 kg N ha^{-1}.
The data presented in Table 2, in respect of the effect of N and P fertilizers on the dry pod yield revealed that application of N and P fertilizers in combinations significantly increased the dry pod yield over a treatment no N and P fertilizers during the year 2016-17. Maximum dose of N and P fertilizers produced maximum increase in dry pod yield to the tune of 11.39 q ha^{-1} which was significantly superior over rest of the treatments comprising of different combinations of N and P fertilizers levels. The interaction of different levels of nitrogen and biofertilizers on the dry pod yield was statistically non-significant during both the years of study.
The dry pod yield of chilli was significantly influenced due to different combinations of phosphorus dose and types of biofertilizers. The dry pod yield produced to the tune of 10.39 q ha^{-1} in the year 2016-17 and 11.38 q ha^{-1} during the year 2017-18 in the treatment P_2B_3 was observed to be maximum. This treatment is at par with the treatment P_2B_2, therefore, showing equal behavior of P solubilizer and dual fertilizers in respect of production of dry pod yield of chilli.
Thus at both the levels of phosphorus, application P solubilizer helped to elevate the dry pod yield.
The interaction effect of N and P levels with biofertilizers was significant only during the year 2017-18. A dry pod yield of 12.93 q ha^{-1} was recorded in the treatment receiving maximum doses of N and P fertilizers, which is statistically at par with the treatments $N_2P_2B_1$ and $N_2P_2B_2$ and significantly superior over rest of the treatments. This showed that the N fixer, P solubilizer and N fixer + P solubilizer are equally effective for increasing the dry pod yield of chilli. These differences are statistically significant, which indicated that even at lower rates of N and P biofertilizers are essential for enhancement of dry pod yield of chilli.
The application of chemical fertilizers with biofertilizers had stimulatory effect on survival of *Azotobactor* and PSB through their direct effect on growth and proliferation of bacteria or indirectly through changing the growth rate and metabolic activities of the crop plants resulting in secretions of more root exudates and thereby creating a favourable habitat for growth and development of the microorganisms. This might have favoured the plant growth and grain and stover yields of chilli Aryal (2016) [2] studied the effect of three levels of nitrogen and three methods of *Azotobacter* application on the yield of chilli. The most effective treatment for the dry weight of fruits was found to be 100 kg N ha^{-1} and seedling inoculation of *Azotobacter*.

Stover yield

The data pertaining to the influence of different levels of N and P fertilizers and biofertilizers on the stover yield of chilli are presented in Table 1. In both the years of experiment, stover yield increased significantly due to increasing levels of N and P fertilizers and different types of biofertilizers.
The stover yield produced in the treatment receiving recommended dose of N was significantly higher over the treatments receiving no nitrogen and 112.5 kg N ha^{-1}, respectively. The maximum stover yield of 10.67 q ha^{-1} and 10.02 q ha^{-1} was noticed in the treatment receiving recommended dose of N fertilizer during 2016-17 and 2017-18, respectively.
The application of phosphatic fertilizer @ 37.5 kg P_2O_5 ha^{-1}and 50 kg P_2O_5 ha^{-1} resulted in significant increase in stover yield, respectively. Maximum stover yield of 9.94 q ha^{-1} and 9.46 q ha^{-1} was recorded in the treatment receiving recommended dose of phosphorus during 2016-17 and 2017-18, respectively.
As regards to type of biofertilizers, application of N fixer and P solubilizer exhibited significant increase in stover yield over a treatment receiving no biofertilizer. The differences in stover yield between the treatments B_1 / B_2andB_3 were significant

however, the differences in stover yield between N fixer alone and P solubilizer alone were non-significant, which indicated that both the types of bioferilizers are necessary for the increment of stover yield of chilli. The similar trend in increase in stover yield was observed during the year 2017-18.

The differences in stover yield due to interaction effect of the levels of N and P fertilizers were significant during both the years. Maximum stover yield of 12.05 q ha^{-1} and 10.65 q ha^{-1} was noted in the treatment N_2P_2 receiving recommended doses of fertilizers during first and second years, respectively. During both the years, this treatment is significantly superior over rest of the treatments.

The interaction effects of nitrogen fertilizers and biofertilizers and phosphatic fertilizers and biofertilizers were significant only during the first year of experiment. Maximum dose of nitrogen with inoculation of both the biofertilizers produced maximum stover yield of 11.23 and 10.31 q ha^{-1}, respectively during the first year.

The interaction effect of N and P fertilizer with biofertilizers on the changes in stover yield were significant during 2016-17 year only. The treatment N_2P_2 receiving recommended doses of nitrogen and phosphorus and both the biofertilizers produced maximum stover yield of 12.85 q ha^{-1}. This treatment is significantly superior over rest of the treatments. The second highest treatment $N_2P_2B_2$ receiving recommended doses of fertilizers and P solubilzer has produced stover yield of 12.28 q ha^{-1}. This treatment is also significantly superior over rest of the treatments. It is further observed that at $N_1P_1$and N_2P_2 levels of fertilizer applications, inoculation of dual biofertilizers significantly produced higher stover yield of chilli, which signified the importance of N fixing and P solubilizing organisms as far as increase in stover yield is concerned.

The reason for the increase in quantity of stover production may be due to the fact that organics might have stimulated biological activity in the soil. The increased activity of invertebrates as well as the microorganisms involved in the various nutrient cycles in the soil might have resulted in better and balanced nutrition of the crop. When organics are added to soil along with inorganic fertilizers, complex nitrogenous compounds slowly break down and make steady N supply throughout the growth period of the crop. This might have attributed to more availability of nutrients particularly nitrogen and subsequent uptake by crop.

Changes in nutrients uptake pattern.

The uptake of major nutrients such as nitrogen, phosphorous and potassium and that of micronutrients such as iron, manganese, copper and zinc was determined periodically upto harvest and the data of the same are mentioned in Tables

Nitrogen uptake

The uptake of nitrogen by chilli plants during two seasons of 2016-17 and 2017-18 revealed that in both the years, nitrogen uptake was significantly increased due to application of 112.5 kg and 150 kg N ha^{-1} over a treatment receiving no fertilizer on all the days of observations. Maximum uptake of nitrogen to the tune of 6.66,12.88, 17.01and 37.13 kg ha^{-1} was registered on 30, 60, 90 and at harvest in the treatment receiving recommended dose of nitrogen 150 kg N ha^{-1} which was significantly superior over the treatments receiving 0 kg N and 112.5 kg N ha^{-1}. During 2017-18 also maximum uptake to the order of 6.62, 12.94, 17.04 and 38.36 kg ha^{-1}respectively was recorded in the said treatment and was statistically superior over rest of the two treatments.

Increasing doses of phosphorous resulted into significant increase in N uptake on all the days of observations. Maximum N uptake was noted in the treatment receiving recommended dose of P during both the years, N uptake increased significantly in the treatment receiving 50 kg P_2O_5 ha^{-1} over the treatment without phosphorous and 37.5 kg P_2O_5 ha^{-1}. Biofertilizers also enhanced N uptake by chilli during all the days of observations during both the years. Biofertilizer application either singly or combination of two resulted into significant increase in N uptake over the treatment receiving no biofertilizer. Inoculation of N fixer had more pronounced effect on increasing N uptake than P solubilizers as the differences in N uptake between the treatments B_1 and B_2 are significant. Inoculation of both the biofertilizers resulted into significant increase in N uptake by chili in all over the days of observations during both the years. It, therefore, signified that both types of biofertilizers are necessary for absorption of N by roots.

The interaction effects between N and P fertilizers were statistically significant on all the days of observations during both the years. From 30 DAT to harvest stages nitrogen uptake increased periodically during both the years. Maximum nitrogen was noticed in the treatment N_2P_2 receiving recommended doses of N and P fertilizers. This treatment is significantly superior over rest of the combinations of N and P fertilizers during the year 2016-17. In respect to nitrogen and biofertilizers combinations significant increase in nitrogen up take was observed at 60, 90 DAT and at harvest stages during both years in the treatment receiving recommended dose of nitrogen with inoculation with dual biofertilizers. Interaction effect between phosphorous with biofertilizers are also observed significant increase in uptake of nitrogen at all stages of during both the years. Maximum uptake of nitrogen was recorded in the treatment receiving 50 kg P_2O_5 $ha^{-1}$with N-fixer + P –solubilizers (N_2B_3).

The interaction effects of N and P combinations and biofertilizers are significant only on 90 DAT and at harvest during two years. The treatment receiving 150 kg N ha^{-1}plus both the biofertilizers recorded maximum uptake of N followed by a treatment receiving 150 kg N ha^{-1}plus N fixer. At all the levels of N and P fertilizer combination, the N uptake obtained owing to the inoculation of either N fixer (B_0), P solubilizer (B_1) and N fixer plus B solubilizer (B_2) was significantly higher over a treatment without any biofertilizers. Owing to inoculation of both the types of biofertilizers significantly higher N uptake was noted in comparison to inoculation of single biofertilizer. This showed complementary effect of both the biofertilizers in N uptake by chilli. Maximum enhancement in N content in shoot was caused when plants were inoculated with three inocula. When soil was treated with 75% N + 100% PK + *Azotobacter* + *Azospirillum*, nitrogen content of dry shoot was increased by 16.2 mg g^{-1} dry shoot over a treatment receiving 75% N +100% PK (Pratheep and Kanchana, 2016) [6].

Phosphorous uptake

The data pertaining to phosphorous uptake by chilli from 30 DAT to at harvest stages during two successive years are presented in Tables 4. At all the stages of crop growth, increasing doses of N from 0 to 150 kg ha^{-1} resulted in significant increase in phosphorous uptake by plants. As compared to no nitrogen application treatment , phosphorous uptake was increased in the treatment receiving 150 kg N ha^{-1} on 30, 60, 90 DAT and at harvest stage respectively. The said treatment recorded maximum uptake of phosphorous on all the days of observations. The similar trend in phosphorous uptake was noted in the next year. At 30, 60, 90 DAT and at harvest stages, the differences in phosphorous uptake between the treatment receiving 150 kg N ha^{-1} and 0 kg N ha^{-1} were statistically significant .

Phosphorous application in gradation from 0 to 50 kg P_2O_5 ha^{-1}, resulted increase in phosphorous uptake in gradation on all the days of observations. Application of P_2O_5 @ 50 kg ha^{-1} resulted in significant increase in maximum uptake by chilli. The differences in P uptake between the treatments receiving 37.5 kg and 50 kg P_2O_5 ha^{-1} were statistically significant on all the days of observations during both the years.

Biofertilizer application with N and P fertilizers resulted in significant increase in phosphorous uptake. On all the days observations, application of N fixer, P solubilizer and N and P biofertilizers produced higher uptake of P values in comparison to no phosphorous application. The differences in phosphorous uptake between the treatments B_2 receiving P solubilizer and B_3 receiving both the biofertilizers were significantly greater, which indicated that both the biofertilizers caused significant increase in phosphorous uptake as compared to individual biofertilizer. At harvest stage, the differences in phosphorus uptake in kg ha^{-1} between the treatments B_3 and B_2 were 0.15 during the year 2016-17 and 2017-18, respectively.

The interaction effects between N and P fertilizers were statistically significant on all the days of observations during both the years. From 30 DAT to harvest stages, phosphorus uptake was increased periodically during both the years owing to increase in periodical increase in dry matter production. Maximum phosphorus was noticed in the treatment N_2P_2 receiving recommended doses of N and P fertilizers. This treatment is significantly superior over rest of the combinations of N and P fertilizers. During the year 2016-17, phosphorus uptake in the treatments N_0P_0, N_1P_1 and N_2P_2 was of the order of 1.84, 3.04 and 5.46 kg ha^{-1}, respectively while during 2017-18 it was of the order of 1.79, 3.35 and 5.46 kg ha^{-1} at harvest stage which showed higher uptake of phosphorus with increasing levels of N and P fertilizers.

The interaction effects between level of N and types of biofertilizers were significant only on 30 DAT during two years of study. The treatment N_3B_3 recorded maximum quantity of phosphorus uptake by chilli on this day of observation.

The interaction effects between phosphorus levels and types of biofertilizers were significant only on 90 DAT and at harvest during 1st year and 30 DAT and at harvest during 2017-18. On these days of study, maximum phosphorus uptake to the tune of 2.08, 4.62, 0.72 and 4.67 kg ha^{-1}, respectively was noticed in the treatment receiving highest doses of P fertilizers and both the types of biofertilizers. The differences in phosphorus uptake between the treatments P_2B_2 and P_2B_3 were statistically significant indicating that both types of biofertilizers are more helpful for P absorption as compared to P solubilizer alone.

The data presented in Table 4.75, revealed that the interaction effects of different combination of N and P fertilizers and bio fertilizers are significant only at harvest stage during the second year of 2017-18 in respect of changes in phosphorus uptake by chilli. Phosphorus uptake was significantly highest in the treatment receiving recommended doses of both the fertilizers and both the biofertilizers. (5.76 kg ha^{-1}) which is followed by the treatment $N_2P_2B_2$ receiving recommended doses of both the fertilizers plus P solubilizer, $N_2P_2B_1$ receiving both the fertilizers plus N fixer alone and $N_2P_2B_0$ receiving only N and P fertilizers. The differences in P uptake between the treatments $N_2P_2B_0$ / $N_2P_2B_1$ and $N_2P_2B_2$/$N_2P_2B_3$ are significant. This signified the role of P solubilizers in enhancement of P uptake when applied in combination with fertilizers. This is true with rest of the combinations of N and P fertilizers as with all the nine combinations of fertilizers, inoculation of either P solubilizer or N + P biofertilizers resulted in the significant increase in phosphorus uptake over no biofertilizer and N fixer treatments. Even in the no fertilizer treatment i.e. N_0P_0, inoculation of P solubilizer significantly increased the P uptake by chilli crop.

The increased uptake of P might be ascribed to more availability of nutrients from added fertilizers and to the solubility action of organic acids produced during the degradation of organic materials. Improvement in the nutritional status of stover due to inoculation of N fixer + P solubilizer along with higher doses of N and P may be ascribed to greater availability of nutrients in soil environment and increased their absorption by the roots and transported towards above ground parts. The phosphorous content of shoot of chilli was increased in the treatment receiving 75% NP +100% K + *Azotobacter* + *Azospirillum* + PSB by 1.8 mg g^{-1} of dry shoot over a treatment receiving 75% NP + 100% NK + PSB. (Pratheep and Kanchana, 2016) [6].

Potassium uptake

The influence of N and P fertilizer levels with biofertilizers on potassium uptake by chill is given in the Table 5. The data showed that the treatment receiving 75% recommended dose of N significantly increased the potassium uptake over a treatment receiving no N fertilizer, while the treatment receiving 100% recommended dose of N fertilizer significantly increased the potassium uptake over a control treatment without N fertilizer on all the days of observations during both the years of experimentation. Maximum potassium uptake was registered in the treatment receiving maximum dose of N fertilizers / Phosphorus application in gradation from zero to 50 kg P_2O_5 ha^{-1} resulted in significant increase in K uptake in gradation with a period of observations. The increase in K uptake owing to 50 kg P_2O_5 ha^{-1} application was significant over the treatment receiving 37.5 kg P_2O_5 ha^{-1}. Application of different biofertilizers also helped to enhance K uptake by plant at all the stages of crop growth during both the *Rabi* seasons. Inoculation of both the biofertilizers resulted in significant increase in K uptake of the treatments inoculated with single type of biofertilizers. At harvest K uptake was increased by 4.27, 4.75 and 8.45 kg ha^{-1} due to inoculation of N fixer, P solubilizer and NP biofertilizers, respectively over a treatment without biofertilizer during 2016-17. While during 2017-18 it was increased by 4.03, 4.48 and 8.70 kg ha^{-1}, respectively. Thus, biofertilizers assisted in the absorption of K by chilli plants.

The interaction effects between N and P fertilizers on the changes in potassium uptake are significant on all the days of observations during both the years. Maximum potassium uptake by chilli plants was recorded in the treatment receiving recommended doses of N and P fertilizers. This was followed by the treatments N_2P_1 receiving recommended dose of N + 75% recommended dose of P followed by the treatment N_2P_0 receiving recommended dose of N without phosphorus application. However, the differences in potassium uptake among these treatments were significant, therefore, indicating that phosphorus is also essential for enhancing potassium absorption.

Application of increasing doses of nitrogen and different types of biofertilizers resulted in significant increase in potassium uptake. Potassium uptake is found to be increased periodically with increasing doses of N fertilizers throughout the crop growth period. The treatment receiving recommended dose of N fertilizer alongwith both the types of biofertilizers *viz.* N fixer and P solubilizer resulted into significant increase in potassium uptake over rest of the other treatments.

Incorporation of P fertilizers with biofertilizes had significant influences on the changes in potassium uptake on all the days except at harvest stage during 2nd year. Maximum potassium uptake in the rage of 6.12 to 42.98 kg ha^{-1} was recorded in the treatment P_2B_3 receiving 50 kg P_2O_5 ha^{-1} plus two biofertilizers. These treatments were significantly superior over the treatments. P_2B_2, P_1B_2 and P_0B_2, therefore, showing the importance of N fixer on P solubilizer over P solubilizer alone or N fixer alone in the promotion of K absorption by chilli plants.

Interaction effects of N & P levels and biofertilizers were significant on 60, 90 DAT and at harvest during 2016-17 and on 30, 60 DAT and at harvest during 2017-18 in respect of potassium uptake by chilli. The treatment $N_2P_2B_3$ registered maximum K uptake on these days of observations. This treatment is statistically superior over rest of the treatments. This treatment is followed by the treatments $N_2P_2B_2$ receiving recommended doses of N and P fertilizer and P solubilizer and $N_2P_2B_1$ receiving N fixer. At harvest, the treatment $N_0P_0B_0$ recorded 16.39, 19.58, 20.50 and 22.71 kg K ha^{-1} at B_0, B_1, B_2 & B_3 types of biofertillizers, respectively while the treatment $N_1P_1B_1$ recorded 23.77, 28.06, 27.63 and 31.08 kg K ha^{-1} at B_0, B_1, B_2 & B_3 types of biofertilizers, respectively.

Potassium uptake was significantly increased due to interaction effects of NP levels and biofertilizers on 30, 60 DAT and A. H. Maximum potassium uptake to the tune of 9.56, 19.26 and 63.66 kg ha^{-1} was noticed on 30, 60 DAT and harvesting stage, respectively. On these days of observations, potassium uptake noted under the treatments receiving both the types of biofertilizers at all the N and P levels was significantly higher over the treatments receiving no biofertilizers, N fixer alone or P solubilizer alone. At harvest of a crop, at all the levels of N and P combinations, the differences between B_1, B_2 and B_3 were significant, however the differences between B_1 and B_2 were not significant. This indicated that both the biofertilizers are necessary for enhancement of potassium absorption by plants

Table 1: Effect of different levels of nitrogen, phosphorous and biofertilizers on yield of chilli.

Treatments	2016-17			2017-18		
	Green pod yield (q ha^{-1})	Dry pod yield (q ha^{-1})	Stover yield (q ha^{-1})	Green pod yield (q ha^{-1})	Dry pod yield (q ha^{-1})	Stover yield (q ha^{-1})
Nitrogen levels						
N_0	66.09	6.98	8.47	63.89	7.31	8.45
N_1	89.40	9.22	8.99	87.80	9.97	8.90
N_2	97.27	9.87	10.67	96.57	11.11	10.02
S.E±	0.55	0.09	0.03	0.65	0.08	0.03
C.D. at 5%	1.66	0.27	0.08	1.96	0.25	0.09
Phosphorous levels						
P_0	69.23	7.18	8.84	68.32	7.80	8.75
P_1	87.50	9.06	9.34	85.93	9.90	9.16
P_2	96.03	9.83	9.94	94.02	10.69	9.46
S.E±	0.55	0.09	0.03	0.65	0.08	0.03
C.D. at 5%	1.66	0.27	8.84	1.96	0.25	8.75
Bio fertilizers						
B_0	71.98	7.50	9.14	71.33	8.31	8.96
B_1	84.81	8.83	9.34	83.53	9.50	9.17
B_2	88.15	9.02	9.35	85.56	9.77	9.10
B3	92.08	9.42	9.67	90.59	10.27	9.27
S.E±	0.43	0.06	0.04	0.43	0.07	0.04
C.D. at 5%	1.49	0.20	0.14	1.49	0.23	0.14

Table 2: Interaction effect of different levels of nitrogen and phosphorous, nitrogen and biofertilizers, phosphorous and biofertilizers on yield (q ha^{-1}) of chilli.

Treatments	2016-17			2017-18		
	Green pod yield	Dry pod yield	Stover yield	Green pod yield	Dry pod yield	Stover yield
N_0 P_0	50.69	5.54	8.42	49.41	5.51	8.43
N_0 P_1	70.79	7.54	8.49	68.52	7.95	8.49
N_0 P_2	76.80	7.87	8.51	73.75	8.48	8.44
N_1 P_0	76.70	7.72	8.70	75.44	8.38	8.54
N_1 P_1	92.21	9.71	8.98	89.90	10.45	8.88
N_1 P_2	99.28	10.24	9.28	98.05	11.07	9.30
N_2 P_0	80.29	8.28	9.41	80.10	9.50	9.29
N_2 P_1	99.51	9.94	10.54	99.37	11.30	10.12
N_2 P_2	112.02	11.39	12.05	110.25	12.53	10.65
S.E. ±	0.96	0.15	0.05	1.13	0.14	0.05
CD at 5%	2.87	0.46	0.14	3.40	NS	0.16

Treatments	2016-17			2017-18		
	Green pod yield	Dry pod yield	Stover yield	Green pod yield	Dry pod yield	Stover yield
$N_0 B_0$	56.63	5.82	8.32	55.74	6.10	8.36
$N_0 B_1$	64.71	6.95	8.53	62.72	7.32	8.50
$N_0 B_2$	69.65	7.35	8.39	65.56	7.69	8.40
$N_0 B_3$	73.39	7.82	8.65	71.55	8.15	8.55
$N_1 B_0$	74.74	7.76	8.96	73.22	8.55	8.67
$N_1 B_1$	90.60	9.48	8.97	89.62	9.96	9.01
$N_1 B_2$	93.91	9.51	8.89	91.64	10.39	8.91
$N_1 B_3$	98.34	10.14	9.13	96.70	10.97	9.03
$N_2 B_0$	84.56	8.91	10.13	85.04	10.28	9.85
N_2B_1	99.11	10.08	10.52	98.25	11.22	10.01
N_2B_2	100.90	10.19	10.78	99.49	11.24	9.99
N_2B_3	104.53	10.29	11.23	103.52	11.69	10.24
S.E. ±	1.11	0.16	0.06	1.31	0.16	0.06
CD at 5%	3.15	NS	0.16	3.71	NS	NS

Treatments	2016-17			2017-18		
	Green pod yield	Dry pod yield	Stover yield	Green pod yield	Dry pod yield	Stover yield
P_0B_0	58.68	5.92	8.71	58.34	6.75	8.61
P_0B_1	67.11	7.17	8.92	67.31	7.50	8.77
P_0B_2	73.91	7.43	8.78	70.69	8.09	8.75
P_0B_3	77.22	8.20	8.97	76.92	8.85	8.88
P_1B_0	73.44	7.61	8.98	73.45	8.77	8.94
P_1B_1	89.02	9.44	9.26	87.49	9.84	9.26
P_1B_2	91.94	9.54	9.38	89.92	10.42	9.14
P_1B_3	95.61	9.66	9.72	92.85	10.57	9.31
$P_2 B_0$	83.80	8.96	9.72	82.21	9.42	9.34
P_2B_1	98.29	9.90	9.85	95.78	11.16	9.49
P_2B_2	98.62	10.08	9.90	96.07	10.81	9.41
P_2B_3	103.42	10.39	10.31	102.00	11.38	9.62
S.E. ±	1.11	0.16	0.06	1.31	0.16	0.06
CD at 5%	3.15	0.46	0.16	NS	0.47	NS

Table 3: Interaction effect of different levels of nitrogen and phosphorous, nitrogen with biofertilizers, phosphorous with biofertilizers on nitrogen uptake (kg ha^{-1}) by chilli plant at different growth stages.

Treatments	2016-17				2017-18			
	30 DAT	60 DAT	90 DAT	A.H	30 DAT	60 DAT	90 DAT	A.H
$N_0 P_0$	1.95	6.96	7.98	14.90	1.85	7.12	7.71	14.73
$N_0 P_1$	2.21	7.41	8.81	18.31	2.20	7.40	8.72	18.45
$N_0 P_2$	2.63	7.63	9.57	19.26	2.49	7.76	9.11	19.82
$N_1 P_0$	3.90	8.64	11.10	21.21	3.74	8.41	10.48	21.40
$N_1 P_1$	4.10	9.02	11.97	25.87	4.17	9.30	11.66	26.05
$N_1 P_2$	4.46	9.60	12.42	27.92	4.54	9.43	12.39	28.76
$N_2 P_0$	5.98	11.20	15.26	29.50	5.71	10.77	14.90	31.11
$N_2 P_1$	6.44	12.50	16.95	36.45	6.51	12.55	16.57	38.19
$N_2 P_2$	7.55	14.93	18.82	45.45	7.63	15.48	19.66	45.79
S.E±	0.08	0.11	0.15	0.57	0.12	0.22	0.22	0.58
C.D. at 5%	0.25	0.32	0.44	1.70	0.36	0.67	0.65	1.75

Treatments	2016-17				2017-18			
	30 DAT	60 DAT	90 DAT	A.H	30 DAT	60 DAT	90 DAT	A.H
$N_0 B_0$	1.77	6.55	7.80	14.56	1.77	6.67	7.58	14.73
$N_0 B_1$	2.53	7.66	9.08	17.73	2.35	7.77	9.00	18.63
$N_0 B_2$	1.98	6.97	8.41	17.16	1.94	7.11	8.21	17.11
$N_0 B_3$	2.77	8.15	9.87	20.50	2.66	8.16	9.27	20.21
$N_1 B_0$	3.55	8.14	10.47	20.07	3.59	7.98	10.20	20.71
$N_1 B_1$	4.58	9.72	12.74	27.19	4.61	9.70	12.37	26.84
$N_1 B_2$	3.67	8.01	10.62	23.27	3.70	7.97	10.28	23.71
$N_1 B_3$	4.81	10.48	13.50	29.46	4.70	10.53	13.20	30.35
$N_2 B_0$	5.96	11.82	15.37	31.41	6.02	11.47	15.04	32.99
N_2B_1	6.81	13.10	17.38	38.36	6.80	13.32	17.38	39.00
N_2B_2	6.27	12.33	16.22	36.14	6.35	12.29	16.84	38.02
N_2B_3	7.59	14.27	19.07	42.62	7.29	14.67	18.91	43.44
S.E±	0.11	0.17	0.17	0.42	0.11	0.22	0.25	0.40
C.D. at 5%	NS	0.485	0.47	1.18	NS	0.62	0.72	1.15

Treatments	2016-17				2017-18			
	30 DAT	60 DAT	90 DAT	A.H	30 DAT	60 DAT	90 DAT	A.H
P_0B_0	3.61	8.43	10.62	18.49	3.46	8.07	10.40	19.63
P_0B_1	4.10	9.05	11.83	22.66	4.01	8.89	11.34	22.49
P_0B_2	3.57	8.36	10.74	20.91	3.58	8.08	10.64	21.68
P_0B_3	4.48	9.88	12.61	25.40	4.03	10.03	11.74	25.85
P_1B_0	3.73	8.84	11.48	22.27	3.87	8.78	11.06	23.50
P_1B_1	4.54	10.04	12.83	27.91	4.51	10.28	12.78	28.08
P_1B_2	3.83	8.95	11.98	26.13	3.93	9.01	11.76	26.88
P_1B_3	4.90	10.76	14.02	31.20	4.87	10.94	13.66	31.79
P_2 B_0	3.93	9.24	11.53	25.29	4.05	9.28	11.37	25.28
P_2B_1	5.27	11.38	14.54	32.72	5.25	11.62	14.62	33.90
P_2B_2	4.52	10.00	12.53	29.53	4.49	10.28	12.93	30.28
P_2B_3	5.79	12.26	15.82	35.97	5.75	12.38	15.97	36.35
S.E±	0.11	0.17	0.17	0.42	0.11	0.22	0.25	0.40
C.D. at 5%	0.32	0.49	0.47	1.18	0.33	0.62	0.72	1.15

Table 4: Interaction effect of different levels of nitrogen and phosphorous, nitrogen with biofertilizers, phosphorous with biofertilizers on phosphorous uptake (kg ha^{-1}) by chilli plant at different growth stages.

Treatments	2016-17				2017-18			
	30 DAT	60 DAT	90 DAT	A.H	30 DAT	60 DAT	90 DAT	A.H
N_0 P_0	0.24	0.82	0.98	1.84	0.23	0.82	0.95	1.79
N_0 P_1	0.31	1.00	1.24	2.51	0.31	0.97	1.19	2.53
N_0 P_2	0.43	1.27	1.61	3.29	0.42	1.23	1.50	3.41
N_1 P_0	0.36	0.78	1.06	2.17	0.36	0.77	1.02	2.27
N_1 P_1	0.48	1.05	1.43	3.04	0.50	1.06	1.36	3.35
N_1 P_2	0.67	1.39	1.87	3.99	0.67	1.38	1.76	4.23
N_2 P_0	0.47	0.90	1.24	2.38	0.46	0.88	1.20	2.90
N_2 P_1	0.60	1.16	1.61	3.54	0.63	1.19	1.53	4.06
N_2 P_2	0.90	1.79	2.29	5.46	0.89	1.76	2.28	5.46
S.E±	0.01	0.02	0.03	0.05	0.02	0.03	0.04	0.03
C.D. at 5%	0.04	0.07	0.08	0.14	0.06	0.08	0.11	0.09

Treatments	2016-17				2017-18			
	30 DAT	60 DAT	90 DAT	A.H	30 DAT	60 DAT	90 DAT	A.H
N_0 B_0	0.26	0.91	1.13	2.14	0.27	0.90	1.08	2.14
N_0 B_1	0.34	1.03	1.26	2.46	0.33	1.01	1.20	2.53
N_0 B_2	0.31	1.05	1.31	2.71	0.31	1.02	1.26	2.71
N_0 B_3	0.39	1.13	1.41	2.87	0.38	1.09	1.32	2.94
N_1 B_0	0.44	0.98	1.34	2.64	0.44	0.95	1.28	2.87
N_1 B_1	0.49	1.04	1.41	2.96	0.49	1.04	1.37	3.19
N_1 B_2	0.53	1.10	1.50	3.25	0.52	1.09	1.40	3.46
N_1 B_3	0.56	1.18	1.56	3.42	0.57	1.18	1.48	3.61
N_2 B_0	0.61	1.18	1.63	3.37	0.60	1.16	1.55	3.72
N_2B_1	0.62	1.21	1.60	3.57	0.63	1.22	1.59	4.05
N_2B_2	0.67	1.31	1.74	4.06	0.70	1.30	1.72	4.35
N_2B_3	0.73	1.42	1.87	4.17	0.72	1.44	1.82	4.44
S.E±	0.01	0.02	0.03	0.05	0.01	0.02	0.03	0.05
C.D. at 5%	0.03	NS	NS	NS	0.03	NS	NS	NS

Treatments	2016-17				2017-18			
	30 DAT	60 DAT	90 DAT	A.H	30 DAT	60 DAT	90 DAT	A.H
P_0B_0	0.32	0.75	1.03	1.81	0.30	0.73	0.94	2.05
P_0B_1	0.34	0.81	1.07	2.04	0.34	0.80	1.03	2.24
P_0B_2	0.37	0.85	1.09	2.22	0.36	0.83	1.08	2.38
P_0B_3	0.41	0.94	1.19	2.44	0.39	0.93	1.18	2.61
P_1B_0	0.40	0.95	1.26	2.50	0.40	0.93	1.21	2.78
P_1B_1	0.44	1.02	1.35	2.87	0.45	1.03	1.32	3.15
P_1B_2	0.49	1.12	1.52	3.36	0.51	1.12	1.45	3.62
P_1B_3	0.53	1.21	1.57	3.40	0.55	1.21	1.46	3.72
P_2 B_0	0.60	1.38	1.81	3.83	0.60	1.36	1.76	3.90
P_2B_1	0.67	1.46	1.85	4.09	0.66	1.43	1.81	4.38
P_2B_2	0.66	1.48	1.94	4.44	0.66	1.46	1.85	4.53
P_2B_3	0.73	1.60	2.08	4.62	0.72	1.57	1.98	4.67
S.E±	0.01	0.02	0.03	0.05	0.01	0.02	0.03	0.05
C.D. at 5%	NS	NS	0.07	0.13	0.03	NS	NS	0.13

Table 5: Interaction effect of different levels of nitrogen and phosphorous, nitrogen with biofertilizers, phosphorous with biofertilizers on potassium uptake (kg ha^{-1}) by chilli plant at different growth stages.

Treatments	2016-17				2017-18			
	30 DAT	60 DAT	90 DAT	A.H	30 DAT	60 DAT	90 DAT	A.H
N_0 P_0	2.50	8.35	10.28	19.80	2.25	8.64	10.37	19.15
N_0 P_1	2.72	8.82	10.33	22.45	2.61	8.55	10.05	22.24
N_0 P_2	3.05	8.96	11.01	22.86	2.97	8.61	10.73	23.27
N_1 P_0	4.28	8.92	11.64	22.96	4.06	8.68	11.10	23.83
N_1 P_1	4.44	9.49	12.44	27.63	4.46	9.39	12.41	30.57
N_1 P_2	4.72	9.78	12.66	31.56	4.68	9.51	12.16	33.70
N_2 P_0	5.34	9.84	12.98	30.16	5.11	9.52	12.46	31.30
N_2 P_1	6.37	12.70	17.06	43.17	6.70	12.83	16.67	44.02
N_2 P_2	8.53	17.75	22.71	59.83	8.53	17.04	21.44	57.08
S.E$\pm$	0.10	0.24	0.22	0.50	0.13	0.24	0.24	0.52
C.D. at 5%	0.29	0.71	0.67	1.50	0.38	0.72	0.72	1.57

Treatments	2016-17				2017-18			
	30 DAT	60 DAT	90 DAT	A.H	30 DAT	60 DAT	90 DAT	A.H
N_0 B_0	2.36	8.07	9.75	19.12	2.19	8.07	9.96	19.06
N_0 B_1	3.00	8.72	10.46	21.55	2.71	8.59	10.08	21.21
N_0 B_2	2.51	8.83	10.71	21.87	2.52	8.44	10.48	21.92
N_0 B_3	3.16	9.21	11.22	24.27	3.03	9.30	11.01	24.01
N_1 B_0	4.26	8.91	11.37	23.69	3.94	8.56	11.01	25.40
N_1 B_1	4.53	9.16	11.96	27.73	4.39	9.04	11.80	29.18
N_1 B_2	4.43	9.14	12.09	27.06	4.40	8.87	11.67	29.19
N_1 B_3	4.69	10.38	13.57	31.06	4.87	10.30	13.06	33.71
N_2 B_0	5.98	11.38	14.95	37.55	5.71	11.28	14.02	37.69
N_2B_1	6.65	13.10	17.01	43.91	6.80	13.03	16.42	43.84
N_2B_2	6.61	13.66	18.19	45.69	7.00	13.02	17.61	44.48
N_2B_3	7.74	15.59	20.18	50.39	7.61	15.19	19.38	50.52
S.E$\pm$	0.10	0.16	0.22	0.50	0.09	0.17	0.31	0.51
C.D. at 5%	0.28	0.46	0.62	1.42	0.26	0.48	0.89	1.46

Treatments	2016-17				2017-18			
	30 DAT	60 DAT	90 DAT	A.H	30 DAT	60 DAT	90 DAT	A.H
P_0B_0	3.84	8.39	10.61	20.61	3.33	8.40	10.38	21.39
P_0B_1	4.09	9.04	11.70	24.51	3.89	8.92	11.25	23.53
P_0B_2	3.89	8.81	11.62	24.34	3.76	8.51	11.29	24.84
P_0B_3	4.34	9.92	12.60	27.77	4.26	9.95	12.32	29.27
P_1B_0	4.04	9.44	12.07	26.38	3.96	8.99	11.90	28.07
P_1B_1	4.65	10.06	12.95	31.16	4.54	10.28	12.57	32.28
P_1B_2	4.22	10.42	13.38	31.64	4.75	10.15	13.34	32.76
P_1B_3	5.13	11.41	14.71	35.17	5.11	11.60	14.37	36.00
P_2 B_0	4.71	10.53	13.40	33.36	4.54	10.52	12.72	32.69
P_2B_1	5.44	11.88	14.79	37.52	5.47	11.45	14.48	38.42
P_2B_2	5.45	12.40	16.00	38.65	5.41	11.68	15.14	37.99
P_2B_3	6.12	13.86	17.65	42.80	6.14	13.23	16.77	42.98
S.E$\pm$	0.10	0.16	0.22	0.50	0.09	0.17	0.31	0.51
C.D. at 5%	0.28	0.46	0.62	NS	0.26	0.48	0.89	1.46

Conclusion

To obtain maximum yield of Konkan Kirti variety of chilli in Alfisols of Konkan region of Maharashtra it is suggested to apply 150 kg N + 50 kg P_2O_5 + 50 kg K_2O + 10 tons FYM per hectare with the inoculation of N- fixer (*Azotobacter chroococcum*) and P solubilizer (*Azpergiillus niger*) @ 0.250 kg per hectare by seedling dip method, which also enhanced the uptake of major nutrients.

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