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Effect of slow releasing soil conditioner Zypmite on the yield and yield attributes of Maize in Kosi Region

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Abstract

Among the important cereal crop of the world Maize (*Zea mays* L.) stands at third both in area sown and production after wheat and rice in India. It accounts for around 10 percent of total food grain production in the country. A study has been formulated to understand the effect of the soil conditioner Zypmite plus (slow releasing soil conditioner) on Maize in the Kosi region of Bihar. Intensive cultivation of the soil aggravates the demand for secondary nutrients and micro nutrients. To improve productivity and manage soil health, use of these nutrients is very essential. Major nutrients NPK are required for growth and development of the Maize crop. But majorly, nutrient requirements vary reliant on the growth stage of Maize. At different growth stages, different sets of nutrients are required. Zypmite is a Soil Conditioner, containing secondary nutrients such as sulphur, calcium, magnesium along with micro-nutrients zinc and boron. Zypmite, when applied along with recommended dose of fertilizer had an impact on maize crop in both the years of study. Doses of 125 kg/ha of Zypmite plus (50 kg/acre) and 187.5 kg/ha of Zypmite plus (75 kg/acre) along with recommended dose of fertilizer were performing better than recommended dose of fertilizer. Soil nutrient availability was also improved by using Zypmite plus for both macro nutrients and micro nutrients.

Keywords: Maize, Zypmite, yield attributes, soil-conditioner

Introduction

Among all cereal crops the third most crucial crop is Maize (*Zea mays* L.) cereal crop of the world and after wheat and rice both in vicinity sown and manufacturing acquired. In India, it is also the third maximum important meals crop after rice and wheat. Numerous states of India consisting of Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu, West Bengal, Bihar, Telengana, Andhra Pradesh and Rajasthan are the essential maize developing states. In phrases of areas and manufacturing of Maize Karnataka is the leading kingdom in India. According to government of India facts 2022, the maize is grown in 10.04 m ha vicinity with 33.62 million tonnes of manufacturing and country wide productiveness of 3349 kg/ha annually. In line with modern-day statistics a place of 8. Seventy-eight m ha cultivated specifically during Kharif season which covers an quantity of 80% vicinity. It almost contributes approximately 9% of the country wide food basket. Further to staple food, maize is serves as a elementary raw cloth as an component to lots of business merchandise that encompass starch, oil, protein, alcoholic drinks, food sweeteners, pharmaceuticals, cosmetics, movie, fabric, gum, package and paper industries and so forth. In India, maize is used as human meals (23%), rooster feed (fifty one %), animal feed (12%), commercial (starch) merchandise (12%), drinks and seed (1% each) that is closer to matching to the global scenario. The maize is state-of-the-art for numerous purposes including grain, fodder, green cobs, sweet corn, baby corn, pop corn for the duration of the year in all states of the country, due to its vitamins price, Maize is taken into consideration as staple food in various states of India. Maize is enriched with starch, fibre, protein and fats at the side of vitamin B complicated, β -carotene and important minerals, i.E. Magnesium, zinc, phosphorus, copper, and many others. Maize additionally incorporates a booster of antioxidant that protects from diverse degenerative illnesses. Maize includes 11% of protein but is poor in amino acids like tryptophan and lysine.

In India numerous hybrids of maize were developed which have the yield advantage of approximately 45 to 50 per cent over conventional genotypes. In spite of this there is lots of scope to enhance the productiveness of maize crop via agronomic manipulation to understand the full genetic yield capability. Vitamins like nitrogen, Phosphorus and Potassium play a vital function for boom and improvement of plants. Farmers are commonly carried out macro nutrient fertilizers and not use or very less use of secondary and micronutrients to the maize crop. The Maize crop is fantastically responsive to micronutrients like sulphur, calcium, magnesium, zinc and boron fertilizations. In maize crop calcium also play a critical position and maize crop is likewise responsive for calcium. It is critical for membrane balance, cell integrity; cellular division and elongation (White and Broadley, 2003) [18]. Application of calcium indicates considerable effect on overall performance of the crop, but their deficiency indicates no signs within the discipline. Like-wise sulphur play a major function in plant increase, metabolism, and enzymatic reactions (Mengal and Kirkby 1987) [10]. It additionally required for the synthesis of sulphur-containing amino acids such as cystine, cysteine, and methionine. It is also a constituent of S-glycosides (mustard oils), coenzymes-A, diet biotine, and thiamine (Tisdale *et al.*, 1985) [17]. Likewise magnesium is also plays important position for improving productivity of maize crop. Cakmak and Kirkby, 2008 [1] mentioned that Mg is the fundamental thing of chlorophyll pigments inside the mild-capturing complicated of chloroplasts and, therefore, it's far worried in photosynthetic CO₂ assimilation and it also participates in sucrose transport, electricity metabolism, Nitrogen utilization, pollen improvement and male fertility, stress tolerance, plant-microbe interactions, and other numerous organic processes (Li *et al.*, 2008 and Tian *et al.*, 2021) [8, 16].

For enlightening the production and productiveness of the crop as well as soil health the micronutrients together with secondary vitamins play a crucial function. Amongst micronutrients zinc and boron are the most important micro nutrients due to their tremendous and increasing deficiency in soil. Maize shows the high sensitivity to Zn deficiency for its physiological requirements. Marschner, 1995 [9] suggested that Zinc activates the plant enzymes with the aid of carbohydrate metabolism, retaining the integrity of cellular membranes, protein synthesis and law of auxin synthesis. Software of zinc fertilizers to maize crop improves zinc contents in tissues and additionally boost its production (Cakmak, 2008) [1]. International-extensive Boron deficiency is extra good sized than every other plant micro nutrient deficiency (Gupta, 1979) [4]. The usage of numerous resources of these vitamins guidelines to boom in fee of manufacturing and coping with of a more number of nutrient resources are a tedious process for the farmers. Zypmite is a new source for deliver of those vitamins at a time. It's miles a soil conditioner, with micronutrient combination containing Sulphur, Zinc, Boron, Calcium and Magnesium. Zypmite allows in a hit soil fertility, growing the intake of NPK fertiliser and enhancing the fine and of yield of plants. Utility of zypmite is likewise enhance the bodily homes of the soil. A subject experiment become below taken during kharif seasons of 2019 and 2020 at research farm of Bhola Paswan Shastri Agricultural university, Purnea to assess the impact of zypmite on overall performance of maize.

Materials and Methods

To know the effect of slow-releasing soil conditioner on maize, an experiment was carried out during 2019-21 at the Research Farm of Bhola Paswan Shastri Agricultural College, Purnea, under Bihar Agricultural University, Sabour, Bihar. The experiment was conducted in Randomised Block design, replication five times with four treatments, namely, Treatments:

T₁ - Control (without fertilization)

T₂ - Recommended Dosage of Fertilizer

T₃ - Recommended Dosage of Fertilizer + Zypmite plus (125 kg ha⁻¹)

T₄ - Recommended Dosage of Fertilizer + Zypmite plus (187.5 kg ha⁻¹)

For each replication the plot length changed into 9m X 9 m. In the course of the test the entire doses of phosphorus and potash had been in particular carried out basal whereas, nitrogen changed into carried out within the split with proper irrigations. Zypmite plus turned into applied as a basal dose within the soil. Zypmite plus is a soil conditioner in which the bottom cloth is gypsum and dolomite (for Calcium, Ca; Magnesium, Mg & Sulphur, S). Boron (B) and Zinc (Zn) were also gift inside the product. It is a slow liberating conditioner and application is basal along with the advocated dose of fertilizer (RDF). The price of soil conditioner Zypmite plus became Rs. 385 in keeping with 25 Kg bag.

After initial soil sample collection, the field guidance was done with ploughed and format was performed in line with the treatments as noted above, as in keeping with the crop sowing became made. Initial soil samples had been accumulated from the complete field following the usual soil sampling process. The amassed soil samples had been analyzed for to be had nitrogen, to be had phosphorus and available potassium by using alkaline potassium permanganate technique (Subbiah and Asija, 1956) [15], 0.5 M NaHCO₃ extractable colorimetric technique (Olsen *et al.*, 1954) [11] and 1 N NH₄OAc (pH 7. Zero) answer (1: five soil: answer ratio) for 5 mins by means of (Jackson, 1973) [19] approach respectively. The initial composite soil pattern studying became with ordinary soil response, no salinity, low soil organic carbon, low to be had nitrogen, excessive to be had phosphorus and medium potassium for each years of experimentation. Plant top become recorded for maize crop at regular c program language period from 5 indiscriminately selected representative flowers from each plot of every replication one by one in addition to yield and yield attributing characters have been recorded as in line with the standard method. The load of maize cob and maize stover was taken after harvesting. The accumulated records had been statistically analyzed separately by using using OPSTAT, Hisar. Imply comparisons had worked out at 5% stage of importance.

Results and Discussions

The results obtained from the present investigation are summarized below:

Plant height of the maize crops

Plant height is one of the growth parameters and has found a positive effect of balanced nutrient application. Data related to the plant height for the two years of study (2019 & 2020) has been shown in Table 1. It shows that the mean plant

height was significantly higher in all the treatments (RDF, RDF+Z₁, RDF+Z₂) over the control (without RDF). Although the treatment effect was at par with one other, represented no significant effect of use of Zypmite plus on

the plant height of the maize crop. The maximum height was recorded with the treatment RDF+Z₂. The increase in the mean plant height varied from 28-34% for the maize crop compared to without fertilization (control).

Table 1: Pooled data of plant height and cob weight of maize crop at maturity from two years of study (2019 & 2020)

Treatments	Plant Height (cm)			Cob Weight of maize (g/cob)		
	Year 2019	Year 2020	Pooled	Year 2019	Year 2020	Pooled
T ₁ = Control (without RDF)	144.2	142.1	143.2	135.00	139.00	137.00
T ₂ = RDF (N:P:K:120:60:40)	187.3	185.3	186.3	178.00	185.00	181.50
T ₃ = RDF (N:P:K:120:60:40)+ Z ₁ (125 kg ha ⁻¹)	193.4	192.0	192.7	188.00	196.00	192.00
T ₄ = RDF (N:P:K:120:60:40)+ Z ₂ (187.5 kg ha ⁻¹)	197.1	195.7	196.4	191.00	199.00	195.00
S.Em±	7.6	7.7	5.4	7.31	7.83	5.36
LSD (P=0.05)	23.4	23.8	15.8	22.53	24.13	15.65

Note: RDF-Recommended dose of fertilizer; Z-Zypmite plus

Cob weight of maize crop

Data related to the cob weight of maize for the two years of study (2019 and 2020) has been shown in Table 1. It shows that the weight of maize cob was significantly higher in all the treatments (RDF, RDF+Z₁, RDF+Z₂) than in the control (without RDF). The cob weight of maize was significantly higher with the treatment RDF+Z₂ but at par with the treatment RDF+Z₁. Use of zypmite plus has significantly improved cob weight of maize at first dose of its along with RDF over the RDF, however yield was at par with the treatment applied with second dose of zypmite plus along with RDF compared to first dose of zypmite plus along with RDF. The increase in the cob weight of maize varied from 32.4-42.3% compared to without fertilization (control). fertilizers, higher yield and higher uptake of nutrients as well as improved soil fertility.

Grain and stover yield of maize

Yield is the actual response of nutrient application in the soil. Data related to the yield of maize and potato crops for the two years of study (2019 and 2020) has been shown in Table 2. It shows that yield was significantly higher in all the treatments (RDF, RDF+Z₁, RDF+Z₂) than in the control (without RDF). The yield was significantly higher with the treatment RDF+Z₂ but at par with the treatment RDF+Z₁ during both years. Use of zypmite plus has significantly improved yield at first dose of it along with RDF over the RDF and control, however yield was at par with the treatment applied with second dose of zypmite plus along with RDF compared to first dose of zypmite plus along with RDF. The increase in the yield varied from 51-78% for maize grain and 39.7-61.2% for maize stover compared to without fertilization (control).

Table 2: Grain and stover yield of maize from two years of study

Treatments	Grain yield (t/ha)			Stover yield (t/ha)		
	Year 2019	Year 2020	Pooled	Year 2019	Year 2020	Pooled
T ₁ = Control (without RDF)	3.04	3.14	3.09	5.07	4.99	5.03
T ₂ = RDF (N:P:K:120:60:40)	4.65	4.72	4.69	7.03	7.02	7.03
T ₃ = RDF (N:P:K:120:60:40)+ Z ₁ (125 kg ha ⁻¹)	5.32	5.42	5.39	7.88	7.86	7.87
T ₄ = RDF (N:P:K:120:60:40)+ Z ₂ (187.5 kg ha ⁻¹)	5.55	5.61	5.53	8.15	8.07	8.09
SE m±	0.205	0.21	0.15	0.30	0.31	0.22
LSD (P=0.05)	0.62	0.65	0.43	0.93	0.95	0.63

Note: RDF-Recommended dose of fertilizer; Z-Zypmite plus

Conclusion

A soil conditioner Zypmite plus had an impact on maize crops in the year of 2019 and 2020 study. Doses of 125 kg/ha of Zypmite plus (50 kg/acre) and 187.5 kg/ha of Zypmite plus (75 kg/acre) along with recommended dose of fertilizer were performing better than recommended dose of fertilizer but the effect of using dose 125 kg/ha had significant effect over the recommended dose of fertilizer.

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