Effect of Planting Depth on Growth Performance of Maize (*Zea-Mays*) at the Experimental Site of Wollo University, Dessie, Ethiopia

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Abstract

The experiment was conducted at the experimental site of Wollo University with the objective of assessing the effect of different sowing depth on growth performance of Maize plant. There were six treatments which were replicated three times. The experimental was layed out in RCBD (randomized complete design). The treatments consisted of 2cm, 4cm, 6cm, 8cm, 10cm and 12cm sowing depth. Analysis of variance revealed a significant effect of depth of sowing on the growth performance of Maize plant (Percentage of plant emergence at 10 days after sowing, number of plant leaves at 15 days after emergence, plant height at one month after emergence and number of emerged plants after sowing by counting stand plants). Sowing at depth of 6cm produced the tallest plant, highest number of leaves per plant, the plant emerged early with 100% emergence. The deepest sowing depth showed poor performance in the parameters considered. Thus for similar agro ecologies of Kelem meda, it is better to apply 6cm depth of sowing. However, the results of the experiment are only morphological parameters and did not include yield components due to limitation of time to accomplish the experiment. Thus the results will be assured, if similar research is going to be conducted in multi locations across seasons.

Key words: Maize, growth performance, experiment

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1. Introduction

Maize (*Zea- mays*) is one of the most important high yielding cereal crops supporting the livelihood of million people across the world. Maize (*Zea-mays*) also known as corn is the world's third most important grain crop after rice and wheat unlike many the cereal grains such as wheat, Rice and Barely that evolved and were selected a food crops in the old world. On wild forms of Maize have been foods. Cultivated maize may have originated from the pod corn indigenous to low lands of southern America. Maize can be grown on wide Varity of soil but performs best on well drained deep loams and silt loam containing adequate organic matter and available nutrients. It is necessarily that the PH of the soil does not deviate from the range 7.5 to 8.5 [1]. Maize plants particularly of the seedling stage are susceptible to salinity and 90% relatively of 1.8 dsm-1 [2]. Maize is also sensitive to water logging.

Accordingly, provision of adequate drainage is essential for economic production. Maize seed germinate 4-5 days after sowing under warm, moist conditions. When temperature is less than optimum 14 to 16 days may be necessary for emergence. Maize was introduced to Ethiopia 16th and 17th century [3] Maize has a wide range of adaptation in Ethiopia. The Bulck of the production of maize comes from Oromiya, Amhara, and South nation nationalities and people Regional states in a descending order [4]. Maize is grown under short and long season mainly rain fed condition. In Ethiopia, maize is produced for consumption both for human and livestock. The green leaves and stalks are used to feed domestic animals.

Farmers in Ethiopia are mostly involved the production of maize as a stable food and their after sale the surplus. One of the problems experienced by the farmers is that of low plant stands due to their planting method that cover seeds through ploughing. This study was under taken to determine the effect of planting depth on growth performance of maize. However the optimum depth of sowing in the field may be 5 cm or even 10cm during period of drought. The outcome of this particular study can be used as an important input for governmental organization and farmers that are planting do develop any farm work to improve appropriate planting depth in a given soil type by considering soil. The most important out comes is related to giving initial information to further work on research to realistically determine planting depth and related to ploughing methods.

General objective

The objective of this is to evaluate the effect of planting depth on growth performance of Maize.

Specific objective

1. To know the germination percentage and time taken for maize seeds to germinate from different depth of planting.
2. To evaluate the performance of maize seeding of different depth planting.

2. Methodology

2.1 Description of the experimental site

The experiment was conducted in south Wollo Zone, Dessie town at the experimental site of Wollo University at Kelem meda which has an altitude of 2600 m.a.s.l, annual rain fall ranging from 900 – 1000 mm and temperature ranging from 12^oc – 26^oc. The soil type of the experimental site is heavy clay soil and the weather condition of the area is under "Dega".

2.2 Experimental Design and treatment

The experiment was carried out in a Randomized complete block design (RCBD) with three replication. The size of each individual plot was $1.5x2.1m=3.15m^2$. The distance between plots, plant, rows, and blocks would be 50cm, 30cm, 70cm, and 1m respectively. The total experimental area was $102.3m^2$. Treatments were assigned randomly to each plot and each treatment appeared only once in each block. The experiment was a single factor with six treatments (planting depths), that were 2cm, 4cm, 6cm, 8cm,10cm and 12 cm.

2.3 Data collection

Data were collected on the following parameters: Number of days for seeding emergence, Percentage of seedling at 10 days emergence, Number of leaves at 15 days after emergence and Plant height at one month after emergence.

3. Results and discussions

3.1 Effect of planting depth on plant height

Depth of sowing is important factor maximizing the potential of plant height. The effect of depth of sowing on plant height of maize plant is represented in table 1. The result showed that plants from 6 cm planting depth differed significantly ($p<0.05$) from 2cm, 4cm, 8cm, 10cm and 12 cm planting depths. Analysis of variance showed significance effect of depth of sowing on maize at 15 days after emergence. The tallest plants were recorded from 6 cm sowing depth. The shortest plant was found in the 12 cm sowing depth plots. In a similar research [5] also reported a significant difference in plant height as affected by planting depth.

Table 1. ANOVA of variance on plant height at one month.

Source of variance	DF	SS	MS	F.cal	F.tab	
					0.01	0.05
Treatment	5	6.28	1.25	3.88	3.33	5.64
Replication	2	0.1	0.05	0.17	4.10	7.56
Error	10	3.22	0.32			
Total	17	9.61				

3.2 Planting depth and leaf number per plant

From table 2, it is easy to understand that the statically procedure analyzed four number of leaves per plant of the different treatment revealed that there was highly significance difference among the different treatments due to the seedling depth. As coefficient of variance (CV) indicated, the experiment is very acceptable because it is less than 20%. The number of leaves indicate detectable significance difference between the treatments. The table indicated that there was variation in number of leaves between the treatments of different seedling depth. The 6cm sowing depth consistently produced the highest number of leaves per plant. This was followed by 4cm, 8cm, 2cm and 12cm, sowing depth. The deepest sowing depth 12cm produced the smallest number of leaves per plant. The results are in line with findings of [5 and 6].

Table 2. ANOVA of leaf number at 15 days after emergence.

Source of variance	DF	SS	MS	F.cal	F.tab	
					0.05	0.01
Treatment	5	7.13	1.42	26.55	3.33	5.64
Replication	2	0.13	0.06	1.23	4.10	7.56
Error	10	0.53	0.05			
Total	17	7.8				

$$CV = \frac{\sqrt{MSC}}{GM} x100 = 12.26\%$$

3.3 Planting depth and time of emergence

Planting depth significantly influenced time of emergence. Time of seedling emergence decrease with increasing planting depth. As indicated in table 3, there is a highly significant difference ($p<0.01$) among treatments with reference to time of emergence. A similar result was observed by [7]. When seeds are gown at higher depth the shoot apex of newly germinated seeds may not able to push up the soil to come out into the surface and the water applied may not acquire wet the soil that can also cause variation in emergence.

Table 3. ANOVA of number of days for the maize seeds from planting up to emergence.

Source of variance	DF	SS	MS	F.cal	F.tab	
					0.05	0.01
Treatment	5	14.45	2.9	7.462	3.33	5.64
Replication	2	0.11	0.058	0.15	4.10	7.56

Error	10	3.38	0.388			
Total	17	18.45				

$$CV = \frac{\sqrt{MSC}}{GM} x100 = 7.28\%$$

3.4 Effect of planting depth on percentage of seedling emergence

As indicated table 4, the number of seeding emergence among different treatments was varied due to different sowing depth. The percentage of seedling emergence significantly varied among treatments. However when the mean performance is analyzed there is no difference among some the treatments. The present study is in agreement with the findings of [6].

Table 4. Percentage of seedling emergence at 10 days after sowing

Source of variance	DF	SS	MS	F.cal	F.tab	
					0.05	0.01
Treatment	5	27.78	5.556	25.522	3.33	5.64
Replication	2	1.8	0.9	4.05	4.10	7.26
Error	10	2.22	0.22			
Total	17	31.8				

4. Conclusions and recommendations

The performances of maize seedlings are greatly affected by the different planting depth. Both too shallow and too deep, planting depths are unfavorable for the growth performance of maize seedlings. As clearly seen in the result, an optimum planting depth (6cm) showed better performance in all the parameters considered. Thus, for similar agro ecologies of Kelem Meda, it is better to apply this recommended planting depth of sowing. However, the results of the experiment are only morphological parameters and did not include yield components due to limitation of time to accomplish the experiment. Thus the results will be assured, if similar research is going to be conducted in multi locations across seasons.

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