International Journal of Advance Research in Science and Engineering
Vol. No.9, Issue No. 10, October 2020
www.ijarse.com
IJARSE
ISSN 2319 - 8354

Probing the impact of different sowing depths on germination and growth performance of maize

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Abstract:

Zea mays the third most important cereal crop in India but the performance of maize is effected by the depth of sowing. A pot experiment is conducted in Nandyal, Andhra Pradesh with 5 different Sowing depths of 2cm, 4cm, and 6cm, 8cm and 10cm in completely randomised design with two replicants and five treatments. The results of the experiment has shown that 6cm depth of sowing is optimum for Maize as a plant soon at 6cm has more plant height, leaf length, leaf area and number of leaves compared to that of 2 cm, 4 cm, 8cm and 10cm whereas the plants sown too Shallow and too deep has shown poor performance. Whereas the experiment was conducted only for the growth parameters are not on yield by this experiment to get a better performance in maize Sowing Depth of 6 centimetres is recommended.

***Key Words**: Maize, Sowing, Depth*

Introduction:

Zea mays is the scientific name of the most commonly cultivated maize with chromosome number of 2n=10, belongingto the family of Poaceae. It is also known as the queen of cereal due to its high yield and nutritious value. It has abundant amount of macronutrients like starch, protein, fibre and fat along with micronutrients like vitamin Bcomplex and essential minerals (Shikha Bathla et al., 2009).The United States of America is the largest producer of maize contributing 34.2% of world production. In India it is the third most important cereal crop after rice and wheat. In 2017-2018 the total maize cultivated area is 29.99 Million hectares with the production of 25.23 million tons. The major maize growing states are Karnataka, Maharashtra, Madhya Pradesh, Tamilnadu, Telangana, Bihar and Andhra Pradesh. Karnataka is the largest

producer with 1.29million hectares area under cultivation and 3.55 million tons production followed by Maharashtra with 1.16million hectares area under cultivation and 3.54 million tons of production. (Directorate of Economics and statistics, DAC&FW) .Maize is grown in different types of climates but performs well in hot regions with annual rainfall of 60cm. It can grow in all types of soils but loamy sandy to clay loamy soils with abundant organic matter are preferred. The pH of 6.5-7.5 is preferred. In India maize is mostly used for poultry (47%) followed by direct consumption (20%). The average yield of maize is about 3 tonnes per hectare which is far less than that of 5 tonnes per hectare in countries like USA,China.The average yield of maize in India is less due to many biotic and abiotic factors like weeds,pests,climate and soil conditions out of which proper sowing depth is one and most important for proper germination and yield. Therefore proper depth of sowing is to be determined and maintained to maximize the growth and yield.

Material and Methodology:

The pot experiment was conducted in Nandyal, Andhra Pradesh in the kharif season of year 2020. This area is present at 27.2048°N and 77.4975°E latitude and longitude respectively with an altitude of 203m. The temperature of the area varies from 12°C-44°C with relative humidity from 13-100 and receives annual rainfall of 400mm/annum. The soils in this area vary from black soils to sandy loam.The experiment materials used during conducting the experiment are pots, bags to transfer soil,spade,marker and stationary like paper, pen, notebook, marker, measuring tape, scale. The fertilizers used are urea and DAP.The experiment was conducted in pot of height 20cm width 19cm and area of 380sq.cm with 2 replicants and 5 treatments and followed Completely Randomized design. The seeds were sown at different sowing depths of 2cm, 4cm, 6cm, 8cm, 10cm. In each 2 seeds were sown at different corners in dibbling method. The irrigation is given for every two days. The fertilizers urea and DAP were given after 30 days of sowing.Data were collected on 15,30,45,60 days after sowing. Growth parameters like germination, plant height, leaf length, leaf area and number of leaves were collected. The data is randomly collected and found mean value to get the parameters.

Result and discussion:

There was significant difference between the treatments in all the growth parameters.

Germination:As stated by Molatud and Marige(2009) that as the main requirement for germination is air, water and heat the seed placed at near to the surface accomplishes their germination earlier than deepest one. In case of the experiment the germination first took place at 2cm deep followed by 4cm deep.

Plant height: Different sowing depth has significant difference in the plant height. The plant height sown at 6cm depth has maximum height whereas the plant sown at 2cm depth has minimum plant height followed by plant sown at 10cm depth. This is because when the plant is sown too deep or too shallow the availability of soil moisture, nutrients, temperature is unfavourable.

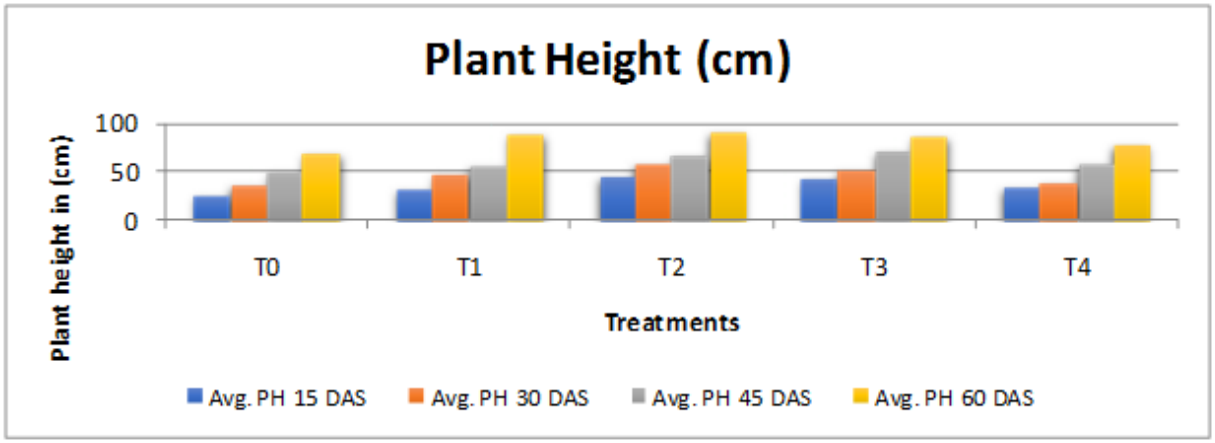
Leaf length:Different sowing depth has significant difference in leaf length. The plant sown at 6cm depth has maximum leaf length whereas the plant sown at 2cm depth has minimum leaf length followed by plant sown at 8cm depth. The leaf length is minimum at 2cm depth because of availability of soil moisture is less and roots are present on the top layers only.

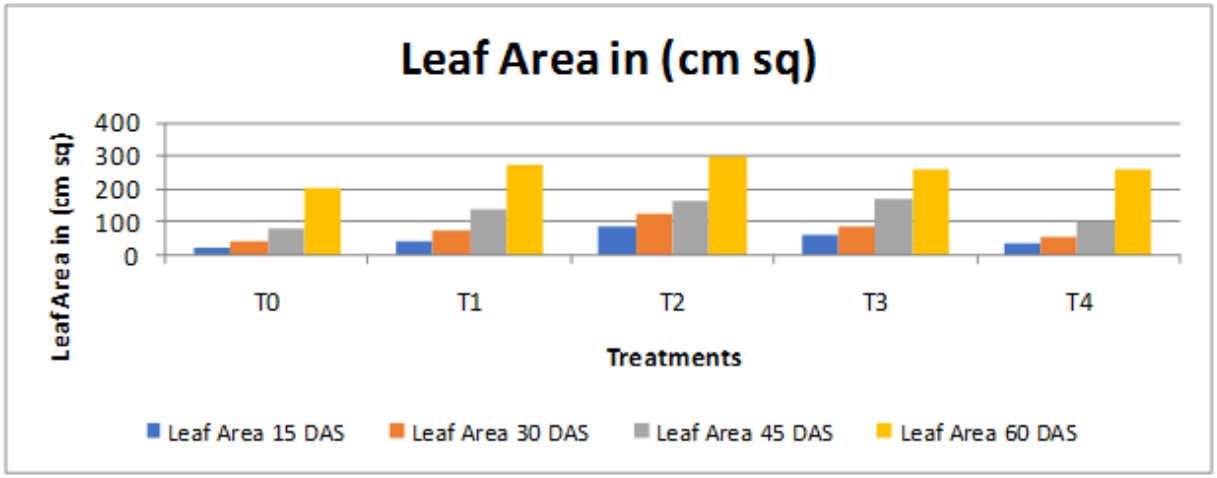
Leaf width:There is a slight significant difference in the leaf width of plants sown at different depth. The leaf width is maximum in plants sown at 6cm depth and minimum at 2cm depth followed by 4cm depth.

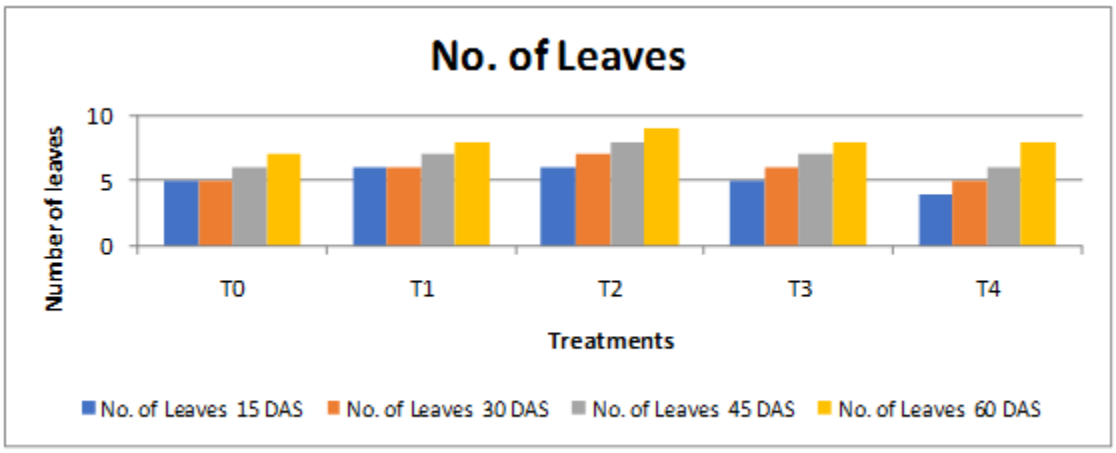
Leaf area:There exists a significant difference in the leaf area of plants sown at different depth. The leaf area is maximum in plants sown at 6cm whereas the leaf area is minimum at 2cm depth followed by plant sown at 4cm deep. As the leaf area increases the absorption of sunlight, photosynthesis and food production increases. This means as the planting depth increases or decreases the leaf area is also affected

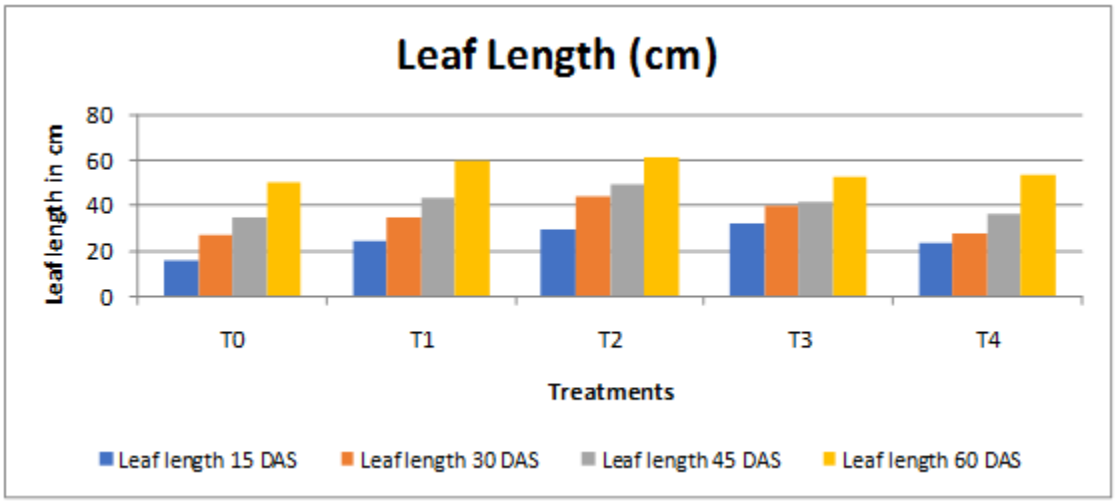
Number of leaves:There is a slight significant difference in the number of leaves in plants sown at different sowing depth. There are more number of leaves in plant sown at 6cm depth followed by 8cm. Whereas plants sown at2cm depth has less number of leaves followed by the plant sown

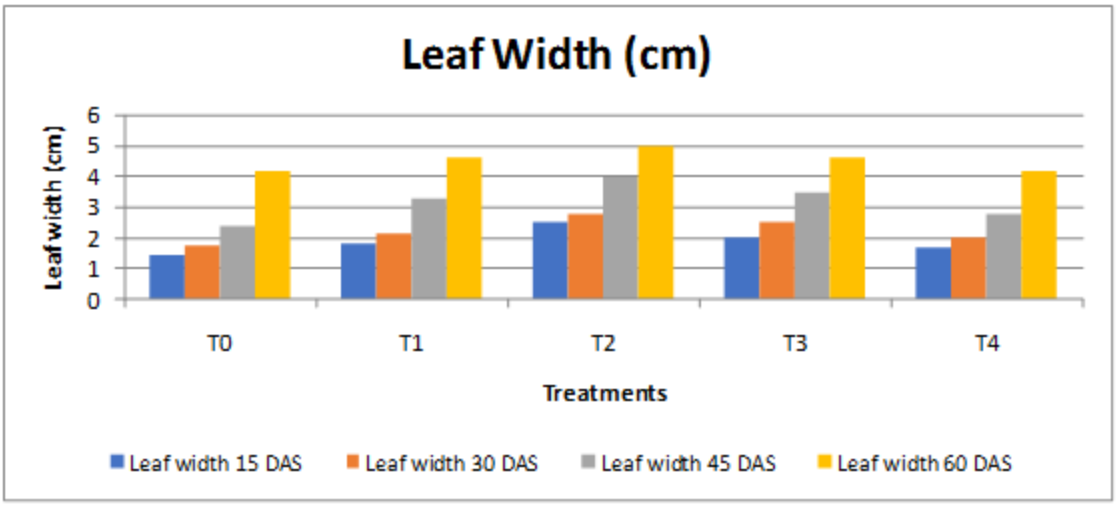
at 10cm depth. This means as the plants are sown too shallow or too deep number of leaves gets decreased in maize plants.






No. of Leaves
Number of leaves
10
5
0
T0
T1
T2
T3
T4
Treatments
No. of Leaves 15 DAS
No. of Leaves 30 DAS
No. of Leaves 45 DAS
No. of Leaves 60 DAS


Leaf Length (cm)
Leaf length in cm
80
60
40
20
0
T0
T1
T2
T3
T4
Treatments
Leaf length 15 DAS
Leaf length 30 DAS
Leaf length 45 DAS
Leaf length 60 DAS


Leaf Width (cm)
Leaf width (cm)
6
5
4
3
2
1
0
T0
T1
T2
T3
T4
Treatments
Leaf width 15 DAS
Leaf width 30 DAS
Leaf width 45 DAS
Leaf width 60 DAS

Summary and conclusion:

Maize is the third most important cereal crop after rice and wheat in India. It is used for different purposes like poultry, human consumption, alcohol etc., although there are many factors that influence the growth of maize sowing depth is also one of the factor that influences the growth of maize. Sowing the seed too shallow or too deep leads to the minimum growth of maize. The plants sown too shallow has less soil moisture availability and root growth is only present in the top layers of soil and may lead to lodging of plant. It may also cause seed injury due to rodents,birds and herbicide concentration. It also causes root injury due to application of herbicides. The plant sown too deep also has adverse effects due to temperature, inadequate soil moisture. The seedlings also cannot emerge properly out of soli. This means plant sown too shallow or too deep leads to uneven crop stand,pollination, and uneven maturity that lead to yield loss and increased cost of harvesting. By this experiment it is shown that the proper depth of sowing is necessary for the plant for proper growth and performance. The results of the experiment has shown that 6cm depth of sowing is the optimum depth of sowing for maize to get better performance

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