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Effect of Different Sowing Depth on Germination and Growth Performance of Pot Experiment of Maize

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Abstract

Globally among all cereal crop Maize is one of the most important crops, production of maize can be increased significantly if sown at the appropriate depth. This Experiment was conducted under the agriculture science under-graduate programme of Lovely Professional University, Punjab; to determine the effect of sowing depth on germination and growth performance of maize. The experiment included 5 treatment of different sowing depth (2cm, 4cm, 6cm, 8cm,10cm) in pot, with 2 replication. The data of the growth parameters were taken periodically like germination percentage date of sowing, leaf length, the height of the plant, and other parameters. The results showed that sowing at depth of 6cm produced the tallest plant, highest no of leaves per plant, leaf length, and showed first tassel initiation as compared to other plants. The 10 cm plant showed late germination, small leaf length, and plant height. However, the results of the experiment were only growth parameters and did not include yield. So, similar further research is needed to be conducted until the final yielding of maize for a better recommendation.

Keywords: *Germination, Growth performance, Maize, sowing depth.*

I. INTRODUCTION

Zeya mays commonly known as Maize are the third most important crop in the world after Rice & Wheat. It belongs to the *Gramineae* family and it originated in Latin America (Essubalew*et al*., 2016). Grown globally over varied soils but performs best on well-drained, deep loams and silt loams containing adequate organic matter and available nutrients; under moist and warm condition seeds germinates in 4-5 days. The pH range of soil should be from 7.5-8.5. The average temperature and precipitation production of maize is 21°c-32°c and 600-3000mm respectively, whereas the optimal temperature for the growth rate of maize plant is 28°c (Brouwer*et al*., 1973). Maize is a determinate annual plant, growing up to 4m tall. Leaves grow alternatively along with the steam. Female inflorescences, the ears grow on the leaf axils on the stalk, whereas male inflorescence tassel grows on top. The broadleaf sheaths are arranged in two opposing rows along the stalk (Pradhenef *et al*., 2009) Maize is internationally superior to most of the other cereal crops, as its grain has greater nutritional value. It contains 72% starch, 10% protein, 4.8% oil, 8.5% fiber, 3.0% sugar and 1.7% ash (FAO, 2011). Maize has a wider consumption by humans and livestock. The crop spreads and is cultivated over 139 million hectares of area and around 600 million tonnes in production (McDonald and Nicol, 2005,

Essubalew *et al*., 2016). India ranks 6th in maize production inthe world as of 2019. The production of maize within the country is 28Mt from an area of around 11 million hectares. The contribution of MP, AP, Karnataka, and Rajasthan is more than half in maize production.Production of Punjab is relatively low at around lakh metric tonnes, in an area of around 1.8 lakh hectares. Being sensitive crop maize cannot tolerate moisture stress, drought, salinity, or waterlogged conditions. The plant needs optimal temperature and moisture for best growth. Sowing depth is the first most important factor for proper emergence and root development. When planting too deep or shallow results found to be uneven germination, growth performance, flowering, and ultimately all these factors add up and cause yield loss. Therefore, it is of great importance to develop and determine the optimum sowing depth of maize. Therefore; planting seeds at different depths would help to test its effect on all growth parameters and to make a better understanding and conclusion.

General Objectives:

- To determine the effect of different sowing depth on germination date and germination percentage of the maize.
- To evaluate the impact of different sowing depths on the growth performance of maize.

II. MATERIALS AND METHODS

This experiment was conducted in pots in the town of Araria in Bihar, India, 854311. The experimental area was located at 26.131319 Latitude and 87.46044 Longitude. The soil used for the experiment was sandy loam and slightly acidic. The experiment consisted of 5 treatments for 5 different sowing depths namely; 2cm, 4cm, 6cm, 8cm, and 10cm. The treatment was replicated 3 times. The variety of maize used in this experiment was WAZIR-2799, being a potted plant it was irrigated every day.

To get results from the experiment few parameters were recorded after the sowing of the crop like sowing date; germination date, and germination percentage after the emergence of the crop once the crop was established the parameters like; plant height, leaf length, leaf width, number of leaves, stem girth were recorded weekly.

Germination date: The date at which seeds sown germinated.

Germination Percentage: It is the ratio or the percentage of seeds germinated to the number of seeds sown.

Plant Height: It is the measurement of the total length of a plant from the base to the tip of the highest leaf or flag leaf.

Leaf Length: It is recorded by measuring the length of the longest leaf or flag leaf of the plant from the base to the tip.

Leaf Width: it is the measurement of the width of the leaf at its widest observable part.

Number of Leaves: The total number of leaves on a plant.

Stem Girth: It is the measurement around the circumference of the stem near the base of the plant.

Measurements were taken from healthy plants, being potted plant measurement was taken from every plant. All the records of measurement were taken at a regular interval of 15 days, except for germination date and percentage, to determine the performance of plants in different treatments and replication.

III. RESULT AND DISCUSSION

After the experiment, it was cleared that the sowing depth influences the germination and growth performance of maize plants significantly. The outcomes of the experiment show that sowing depth is an integral factor for the germination time and rate, the height of the plants and the length of the leaves, number and width of leaves, and the girth of the stem, furthermore the growth vigour of the plants. It is additionally obvious from the experiment that the impact of sowing depth on the development of plant stays the same at all phases of development. The sowing depth uniformity consistently influenced the plants at 15DAS, 30DAS, 45DAS, and 60DAS. Throughout the experiment, different parameters were recorded regularly and it was observed that the plant is sown at 6cm performed best, followed by the plants sown at 4cm, and the plant sown at 10cm showed the least growth performance with late germination. Similar findings were observed by (SeidHussen*et al.,* 2013) at Wollo University, Ethiopia. also, (Aikinss*et al*., 2006) founded the 6cm sowing depth consistently produced the highest number of leaves per plant, followed by 4cm, 8cm, 2cm, and 12cm, sowing depth. The smallest number of leaves per plant was observed in the 12cm depth sown plant.

3.1*Germination Date:* Seeds are sown at 2cm germinated and emerged first as they are close to the surface, followed by rest. 10cm deep sown seed germinated and emerged late by one day than the rest of seeds, this happened because the distance from the surface is greater compared to the rest of seeds.

3.2*Germination Percentage:* After four days of sowing T0, T1, T2 germinated (60% germination). After, five days of sowing T3 germinated (80% germination) and six DAS T4 pot had germination (100% germination). GP = seeds germinated/total seeds *100. Deep sown seeds emerged late, due to distance of seed from surface, also nutrient availability decreases due to leaching.Generally, as the planting depth increased, the germination percentage of the crop decreased. This might be as the depth may increase the moisture, temperature and other environmental factors might have been not suitable and also the potential of maize seed cannot come out. This increases the risk of poor or uneven germination. This result is in confirmity with the findings of Paldh (2004) and Ghaderi-Far, *et al.,* (2010) reported that seed size, sowing depth, land preparation and environment influence the germination and emergence of the seedlings.

3.3*Plant Height, Stem Girth :* At all development phases and recording intervals of the crop under examination, the plants in the 6cm treatment were best in achieving all the growth parameters, starting from germination till attending maturity; followed by 4cm, etc. Even though there were a couple of exemptions and variations, however, the outcome was genuinely uniform. Plant height and stem girth was recorded at different intervals. The data was presented in fig1,2.

3.4*Number of leaves:* A significant difference was observed among different treatments. The number of leaves was more in 6cm sown plant at all growth stages, followed by 4cm. Less number of leaves were observed consistently in the 10cm sown plant, approximately till 30 DAS, one of the reasons for this is the fact it germinated late.Therefore, we can correlate that the number of leaves decreases as planting depth increases. Fig 3,4

3.5*Leaf Length, Leaf Width:* The analysis of these parameters shows a significant difference among the treatment which we conducted on maize (fig 4,5). The highest leaf length and leaf width were recorded with the planting depth of 6cm, However, the least leaf length and width was observed with a planting depth of 10cm. Leaf length and width possess an important role in plants as they help to absorb sunlight and do photosynthesis to produce food, also the leaf size is directly proportional to sunlight for the production of food.

Generally, planting depth has a greater influence on crop growth and yield, this is due to the fact the availability of the nutrients is more in shallow level, and as we go deep nutrient concentration decreases which also decreases the germination rate of seed and seed vigour. the results of this finding are in line with TamiratWato, ASOSA (2002).

IV. FIGURES AND CHART

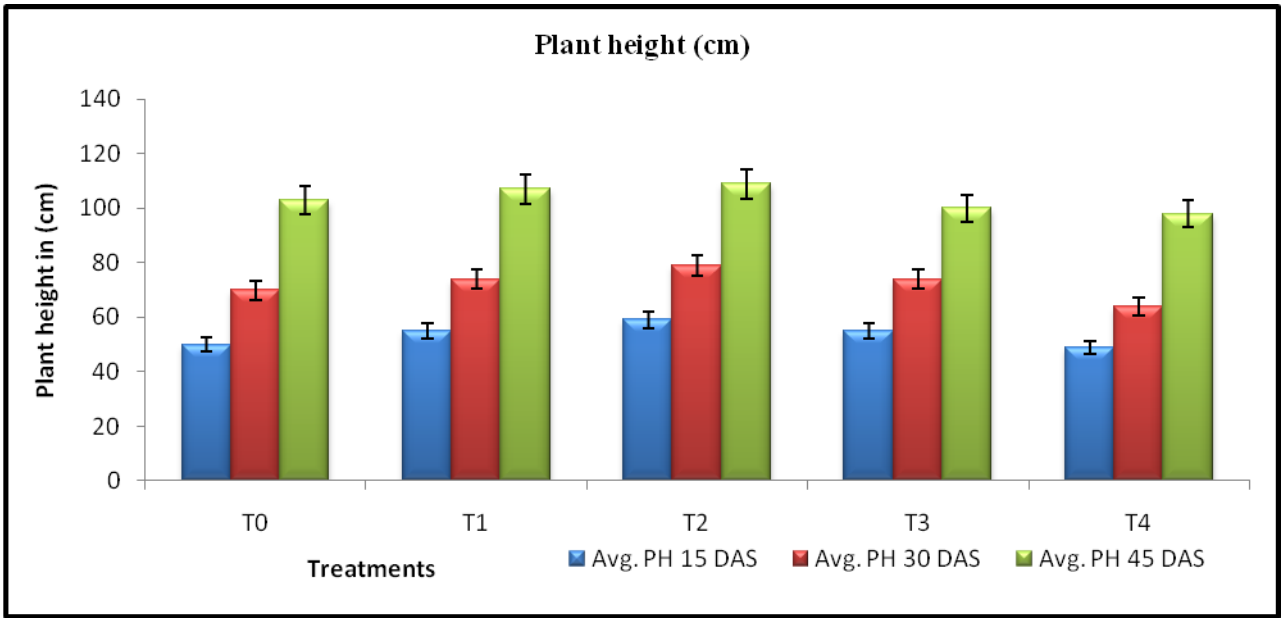

Fig.1 representing the plant height (cm) at different intervals influenced by different depth of sowing.

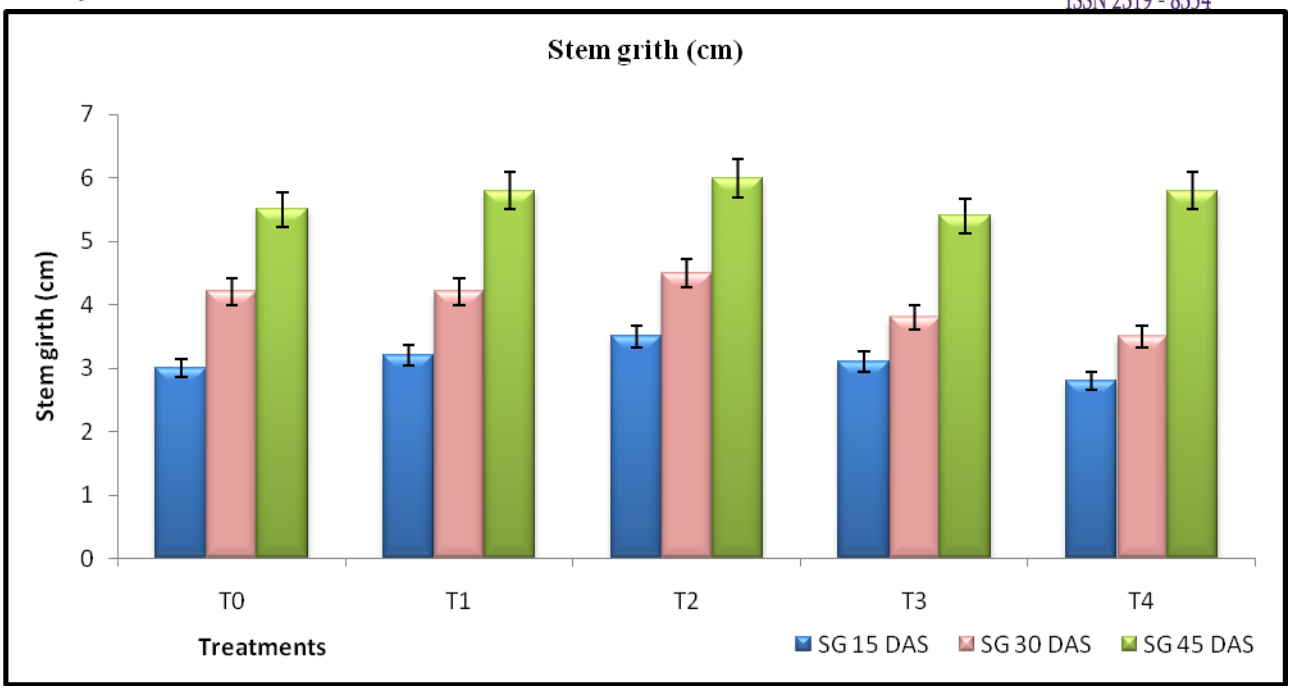

Fig.2 representing the stem girth (cm) at different intervals influenced by different depth of sowing.

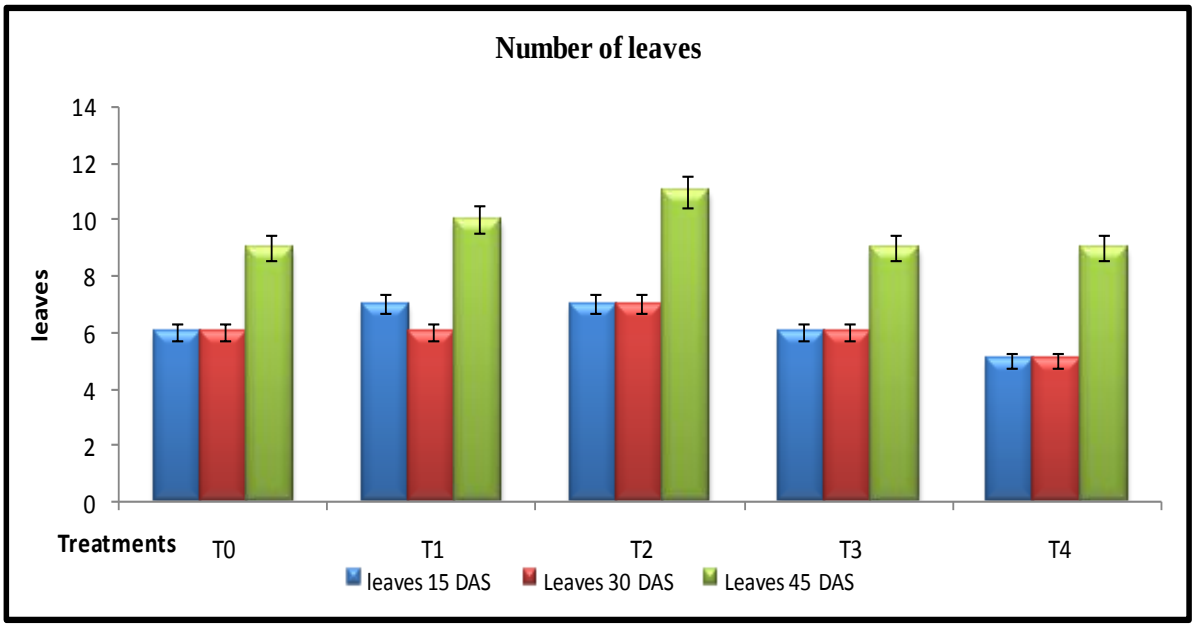

Fig.3 representing the number of leaves at different intervals influenced by different depth ofsowing.

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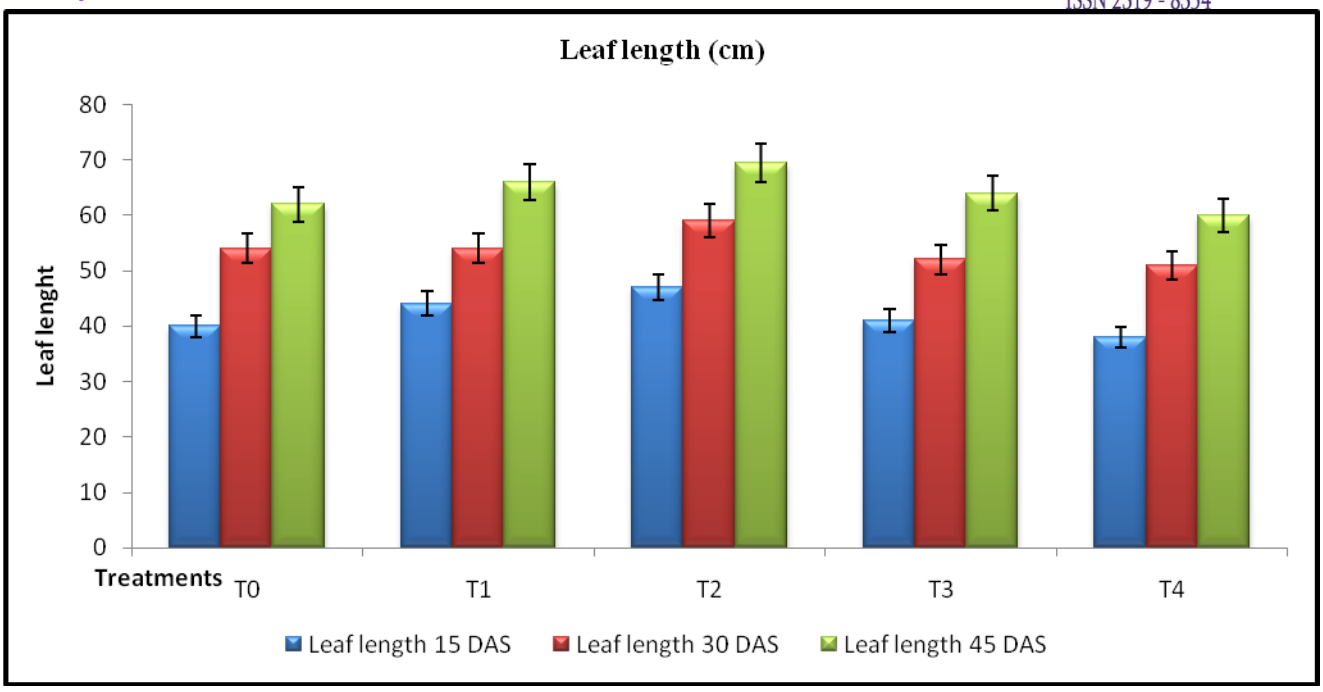

Fig.4 representing the leaf length (cm) at different intervals influenced by different depth of sowing.

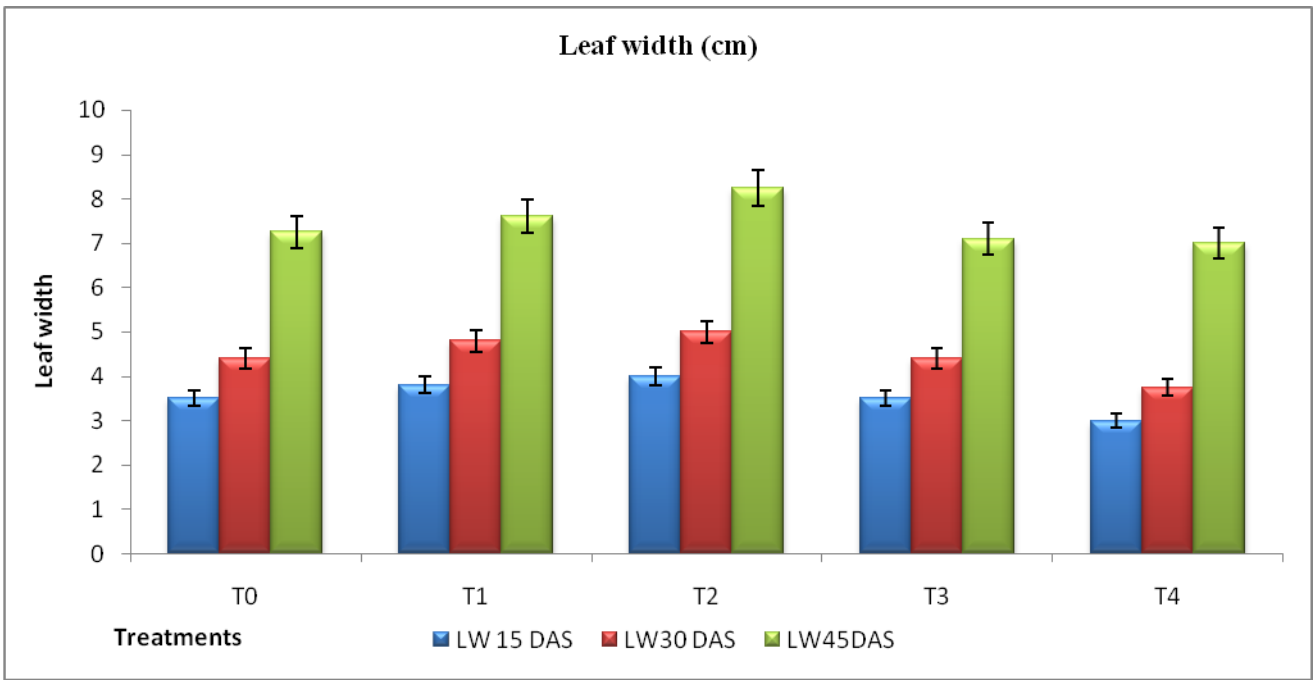

Fig.5 representing the leaf width (cm) at different intervals influenced by different depth of sowing.

V. Conclusion:

Globally maize is one of the most important crops for both humans and livestock, being a sensitive crop its productivity is influenced by various factors. Depending upon soil and climate conditions sowing depth is a critical factor for the performance of maize. As it is recommended and observed that 5-6cm deep sown seeds perform to its full potential.

Whenever planted too shallow or too deep, the plant doesn't perform up to its maximum capacity. At shallow depth, the nutrients get leached down and the plant faces harsh conditions. Deep planted seeds may get suffocated and covered, or even after the germination, the plant does not perform well. Also, unsynchronized flowering due to late germination affects fertilization ultimately productivity is reduced. Accordingly, maize ought to be planted at the appropriate depth to optimize its growth and development, also productivity.

References:

[1] Essubalew G., Berhanu S., Mebrate M., 2016**.** Effect of Different Sowing Depth on Germination and Growth Performance of Maize (*Zea mays* l.) at Jimma, Southwest Ethiopia.*International Journal of Research and Innovations in Earth Science Volume 3, Issue 2, ISSN (Online): 2394-1375.*

[2] Brouwer, R., Kleinedorst, A. and Locher, J. Th., 1973. Growth responces of maize plants to temperature, pp. 169-74. In *Plant responses to climatic Factors,* Proceedings of the Uppsala Symposium 1970, ed. R. O. Slayter, UNESCO, Paris.

[3] Pradhenef H. P, Khoyomerhen, S.Bele, and T.K Basu. 2009. Effect of planting depth on the yield of maize. *Environment and Ecology, 27(91);173-175.*

[4]FAO(Food and Agriculture organization of the United Nations). 2011.

[5] A.H. McDonald and J M Nicol. 2005. Nematode Parasites of Cereals. pp. 131-191. In: Luc, M., Sikora, R.A. and Bridge, J. (Eds). Plant-parasitic nematodes in subtropical and tropical agriculture, 2nd edition. Wallingford, UK, CABI Publishing

[6]SeidHussen, BrzegenAlemu, Fentaye Ahmed (2013) Effect of planting depth on growth performance of maize (Zea-Mays) at the Experimental site of Wollo University, Dessie, Ethiopia.

[7]Aikinss.H.M; Afuakwa, J,J. and Baidoo, D (2006). Effect of planting depth on maize stand establishment. Journal of chana institution of Engineeres, 4(2):20-25

[8]Ghaderi-Far, F., Gherekhloo, J., and Alimagham, M., 2010. Influence of environmental factors on seedgermination and Seedling emergence of yellow sweet clover (*melilotusofficinalis*).

[9] Association of Organized Social Agency (AOSA). 2002. Seedling vigoursity of field crops especially on maize.