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Study On The Effect of Different Concentration of Drumstick (*Moringa oleifera*) Leaf Extract on Seed Germination and Early Growth of Water Mellon (*Citrullus lanatu*)

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ABSTRACT

A study on the effect Moringa Oleifera leaf extract on Citrullus lanatus was carried out at the Biological Garden of Usman Danfodiyo University, Sokoto. The aim was to determine the effect of Moringa leaf extract at different concentration on seed germination and early seedling growth of C. Lanatus (water Mellon). Aqeotus extract was prepared by driving freshly leaf formed Moringa leaves with water and filted out to obtain liquid extract which was then diluted with water in the following concentrations: 0ml, 20ml, 40ml, 60ml, 80ml. control treatment was set up using disliked water only. The six treatment were applied directly on C. lanatus seeds raised in 18 poly pots of 18cm long 2cm wide. The experiment was laid out in a completely randomize design in three (3) replicate. It was run for 15 days. Data were collected on number of leaves, stem high, root length, shoots fresh and dry weight at harvest, while germination rate was within 15 days of the experiment and where subjected to analysis of varience. Result obtain showed significant ($P \leq 0.05$) effect of the treatment on all the characters measured. Base on the results obtain, Moringa leaf extract has an improving effect on seed germination and growth of C. lanatus parts farmers are therefore recommended to adopt the use of this extract since it is

easier, inexpensive, cheaper and can be obtain in large quantities in order to meet up demand of large hectares of land

INTRODUCTION

Seed germination refers to the resumption of active growth of the embryo, which results in the rupture of the seed coat and emergence of the young plant. This presumes that the seed has been in a state of rest after its formation and development. During the period of rest, the seed is in a relatively inactive state and has a low metabolic rate. The seed can remain in this state until the time and place arc right for resumption of growth. Some seed are capable of germinating soon after germination and long before their normal harvesting time, while others may be dormant and require an extended rest period or additional development before germination can occur. Depending on the species, this period may last for only a few days or for several years (Cheema, 1988).

Seedlings start to establish itself in the soil, when it begins water uptake and photosynthesis; that is manufacturing most of it own food from sunlight. It gradually becomes independent of the exhausted storage tissue, and then the germination process is complete (Duke, 1985).

Watermelon is a member of the family *Cucurbitaceae*, with scientific name *Citrullus lamatus*. It is related to the cantaloupe, squash, pumpkin and other plant that also grow on vines on the ground. Shapes of watermelon can be round oblong or spherical with a thick rind, often spotted or striped. They range in size from 2267.9 g to 40823.3 g). We often associate a deep red pink color with watermelon; in fact there are varieties that feature orange, yellow or white flesh. Most

watermelons have seeds that are black, brown, white, green or yellow and few varieties are actually seedless. Watermelon has an extremely high water content of approximately 92% and the remaining 8% is loaded with lycopene, an antioxidant it giving its flesh a crumbly and subtly crunchy texture making ii a favorite thirst quenching fruit. Some varieties of watermelon can be stored for a long time and serve as the source food and water during drought prone periods (Vander Vossen *et al.*, 2004). Domestication of watermelon has led to the development of indigenous land races; varieties with the capacity to tolerate biotic and abiotic stresses, resulting in high yield stability and an intermediate yield level under a low impact agricultural system (Zeheng, 1994).

Watermelon is an important and successful crop worldwide popularly for its juicy sweet fruits. It is an ideal health food due to its high water and sugar composition. Watermelon subsequently spread over Africa and to other continent. The important crop occupies a special place in the life and culture of many ethnic groups in Nigeria (Wehner, 1991).It is one of the most popular fruit consumed. It is a very good source of citrulline, vitamin 65, vitamin bi, vitamin C, vitamin A. magnesium, nitrate, sodium, phosphorus, calcium and potassium. Potassium helps to lower high blood pressure and fight kidney stone formation. Calcium help to build up strong bones. The fruit is a rich source of essential minerals, it is a favorite fruit tor all weight watchers and also helps to lower the risk of stroke and controls blood pressure (Cho *el al.*, 2004).

Moringa oleifera is a small shrub or tree that can reach 12m in height at maturity and lives up to 20 years. It has deep root and therefore can survive in dry region, which has a wide open

crown with a single stem. *Moringa* is a healer source of food beautification and a plant with surprising water purification capabilities. It is one of the most useful trees on earth which makes a major contribution to human and animal health (Anwar *et al*. 2007).

Several researches have indicated that M. Oleifera (family: Moringaceae) is a highly value plant with multipurpose effect (Mishra *et al*., 2011). The tree ranges in height from 5 to 10 m, it is found wild and cultivated in many countries of the tropics and subtropics (Morton, 1991). It is considered as one of the world's most useful trees, as almost every part of the three have an impressive effect of food, medication and industrial purpose (Khalafalla *et al*., 2010). It is also a good source of natural antioxidant (Anwar *et al*., 2007). Concerning it medicinal value, it act as cardiac and circulatory stimulants, posses antitumor, antipyretic, antiepileptic, anti-inflammatory, antiulcer, antispasmodic, diuretic, antihypertensive, cholesterol lowering, antioxidant, antidiabetic, antibacterial and antifungal activities, it is also employed for the treatment of different ailments in the indigenous system of medicine particularly in south Asia (Murmitsu *et al*.,2000). Moringa *oleifera* is one of such alternative, being investigated to ascertain it effect on growth and yield of crops, thus can be promoted among formers as a possible supplement or substitute to inorganic fertilizer (Phiri, 2010).

OBJECTIVES

The aim of this research work is to access the effect of M. oleifera leaf extract on seed germination and early seedling growth of *C. lanatus*. While the objectives of the research are:

- To determine how *Moringa* leaf extracts can affect growth

of watermelon at different concentration.

- To evaluate how Moringa leaf extract can increase growth parameters measured as plant height, number of leaves, and germination percentage of watermelon.

MATERIALS AND METHODS

Ripe fruits of watermelon were purchased from the Ramen Kura vegetable market in the outskirt of Sokoto town. The fruits were taken to the Herbarium of the Department of Biological Sciences, Usmanu Danfodiyo University. Sokoto for authentication, were [he specimen voucher was deposited. Similarly, fresh leaves of Moringa oleifera were purchased from a garden within the University premises. Voucher specimens were deposited after authentication as above.

MORINGA LEAF AQUEOUS EXTRACT PREPARATION

Young Moringa leaves were harvested, thoroughly washed with water and air-dried at room temperature (27+2°C). Six different water extract concentrations were prepared by grinding using pestle and mortar at 0 ml, 20 ml, 40 ml, 60 ml, 80 mi 100 ml, and were measured using measuring cylinder in 100 ml each of distilled water (SDW) to produce 0%, 25%, 50%, 75% and 100% extract concentration respectively. The extract was then sieved through a sterile cheese cloth. The extract was stored in a sterile conical flask. Moringa leaf extract was used to water the plant each day of the experiment (Farroq et al., 2006)

Seed viability test and treatment

Seed viability test was carried out on freshly harvested sects in the crop science laboratory, using some randomly selected ones, adopting the method of Etejere and Ajeboye (1990).

Twenty (20) seeds were placed in Petri-dishes, with filter paper moistened with water and covered which was replicated three times and after an interval of 24hours for three days, (lie number of seeds that germinated were recorded respectively and about 20 seeds were soaked in concentrated sulphuric acid for the period of 5-15 minutes. The acid was there after poured away and the seeds were rinsed in several changes of distilled water before placing on moistened filter pa-per placed on 9 cm Petri-dishes. The set up was maintained at28-30°C laboratory condition andeach of the germination tests was replicated three times.

Germination count was made with the emergence of the radicle to a length of2mm after 3-
7 days of sowing. Mean value for the percentage germination was calculated.

Control

Distilled water was used as control which was obtained from the Department of Biological Sciences laboratory.

Filling of Poly Pots and Seed Sowing

Twenty four (1 8) polythene pots were filled with a well-drained sandy-loam soil enriched labeled appropriately which include those to be treated with Moringa leaf extract on different concentration (0%, 25%, 50%, 75%, 100%) and distilled water to be labeled C. which served as the control respectively. They were then arranged in rows in a completely randomized design by balloting and replicated three (3) times. Three (4) seeds of the watermelon were sown in each polythene bag at the depth of 1 cm and germination was studied two weeks after the date of sowing.

Measurements of Seedling Growth

Adopting the method reported by Phiri (2010), the plant was watered everyday with the extract and germination percentage, plant heights i.e. root and shoot lengths, the number of leaves, fresh and oven dry weights of shoot and roots respectively. All observations were recorded in replicates. Plant heights (stem & root length) at the time of harvest were measured using meter rule in each replication and averaged to get mean stem length per replication whereas fresh and dry weights of seedlings were taken with the help of a weighing balance at the time of harvest, for each replication, then oven-dried at 70 ± 2 CC until they readied a constant weight for the determination of dry weight (Basra *et* a*l*., 2011), Data was obtained using following the analysis of variance (Genstat, 2008) and table was plotted accordingly.

Germination test

Seed germination lest was carried out according to an experiment determined by Tsai*et al*. (1997), at the Biological garden of Usmanu Danfodiyo University, Sokoto. Treatment comprised of control (distilled water), ratio 25%; "50%, 75% and 100% concentration of Moringa leaf extract. The Petri-dishes were arranged in a completely randomized design (CRD) with three replicates of each treatment (totally 24 Petri-dishes) of 18cm in diameter which were washed with deionized water and lined with what man's filter paper .

Duration of germination was recorded when at least 50% of seed germination, germination percentage was recorded at 24hrs interval for 14 days, when it was apparent that seed germination has come to an end, leaves, branches and seedling survival was recorded on day fourteen at the end of the study. Germination percentage was calculated using the following

formula below;

Germination %=$\frac{Total\ number\ of\ seeds\ germinated}{Totl\ number\ of\ seeds\ sown}$x 100

The daily germination speed will be calculated using the formula $\frac{GP}{D}$

Where

GP refers to germination percentage of seeds per day.

D is the number of clays the seeds germinated at an interval of two (2) days from the beginning of the germination.

The daily germination value (GV) will be calculated using the formula of Djavanshir and Pourbiek (1976).

GV= $\frac{\varepsilon \frac{DGS}{N}}{10}$

DOS is the daily germination speed.

GP is germination percentage.

N is the number of days germination has taken place.

10 is Kotowiski's coefficient of velocity of germination which is constant.

Result

It was observed that the different concentration of Moringa oliefera leaf extract has significantly affected the germination rate of C. *lanatus* at different concentration (0ml, 20ml, 40ml, 60ml, 80ml, and100ml) within the period of 15 days at p< 0.05. 100 ml of M. oliefera extract gave the highest germination percentage increase of 58%, followed by 80 mls of 50%(Table1) so the oil treatment at different concentrations were all consistent with the findings of Foidl*et al.* (2001) who reported a general increase and improvement of crop performance in response to application of leaf extract of M. oleifera.

M. oleifera Leaf extract was also found to have a significantly affects on early seedling growth of *C. lanatus* at different concentration which was observed on the 15th day of germination. M. oliefera significantly ($p< 0.05$) increase mean number of leaves at 60% and 300% of 7.33±0.58 and 7.33±1.53 respectively(Table 2), compared to untreated and differently treated plants. Also the mean stem height (cm) of watermelon plant measured immediately after germination on the 15lh day under different concentration showed that 100 mls of *M. oringa* leaf extract gave the highest mean stem height of 11.83 cm followed by 60 mls of 10.33 cm compared to the other concentrations. Similarly the maximum increase in mean root length (cm) of 3.93±1.79 was obtained from 100 mls of the extract followed by 3.43 $\pm$ 1.55 of 20 mls of the extract respectively, compared to other concentration. The highest increase in shoot fresh weight of 16.39 g and 12.05 g was recorded from the treatment 100 mls and 20 mls of M. oringa leaf extract respectively, while the lowest shoot fresh weight was obtained from 40 mls of the extract. Also the highest increase in root fresh weight was obtained from 0 ml and 80 mls of 0.83 g and 0. While the lowest increase in root fresh weight was obtained from 40 mls of the extract. The maximum increase in shoot dry weight of 1.84 g was obtained from 100 ml and the lowest increase was obtained from 40 mls of 1.06 g respectively. Similarly, the maximum increase in root dry weight of 0.09 g was obtained from 80 ml and 100 ml respectively while the lowest increase of 0.02 g was obtained from 20 ml of the extract concentration.

Table 1: Percentage germination in days on the effect of different concentration of *Moringa* leaf extracts on *Citrullus lanatus*(watermelon)

Extract Cont.	3	Number of days6	(% germinating) 9	12	15	Total%
A0	0.00±0.00^{b}	16.67±0.58^{b}	8.33±0.58^{b}	8.33±0.58^{a}	0.00±0.00^{a}	33%
A20	0.00±0.00^{b}	25.001±.00^{a}	16.67±0.58^{as}	0.00±0.00^{b}	0.00±0.00^{a}	33%
A40	0.00±0.00^{b}	16.67±0.58^{b}	8.33±0.58^{b}	0.00±0.00^{b}	0.00±0.00^{a}	25%
A60	0.00±0.00^{b}	25.00±1.00^{a}	8.33±0.58^{b}	8.33±0.58^{a}	0.00±0.00^{a}	33%
A80	0.00±0.00^{b}	25.0±01.00^{a}	16.67±0.58^{a}	8.33±0.00^{a}	0.00±0.00^{a}	50%
A100	8.30±0.58^{a}	25.0±01.00^{a}	16.67±0.58^{a}	8.33±0.33^{a}	0.00±0.00^{a}	58%

Results presented as ± SD, n=3, means with similar letters were significantly different ($p \leq 0.05$)

Table 2: Effect of different concentration of *Moringa* leaf extracts on early seedling growth of *Citrullus lanatus* (watermelon).

Extract Cont.	Number of leave	Stem height (cm)	Root length (cm)	Shoot fresh weight (g)	Root fresh weight(g)	Shoot dry weight(g)	Root dry weight(g)
A0	4.33±1..53^{b}	7.00±2.78^{d}	3.13±1.50^{b}	6.28±0.03^{a}	0.83±0.02^{a}	0.81±0.02^{a}	0.04±0.02^{a}
A20	6.00±1.73^{b}	9.17±6.32^{a}	3.43±1.55^{a}	12.04±0.04^{a}	0.21±0.02^{a}	1.25±0.02^{a}	0.02±0.02^{a}
A40	4.33±2.24^{a}	7.33±4.75^{c}	2.63±0.73^{c}	4.79±0.02^{a}	0.13±0.015^{a}	0.56±0.03^{a}	0.03±0.03^{a}
A60	7.33±0.58^{c}	10.33±1.44^{e}	2.87±0.42^{c}	9.89±0.03^{a}	0.14±0.02^{a}	1.06±0.03^{a}	0.04±0.02^{a}
A80	6.67±0.58^{c}	8.00±1.34^{e}	2.90±1.44^{c}	5.13±0.02^{a}	0.24±0.03^{a}	1.09±0.01^{a}	0.09±0.02^{a}
A100	7.33±1.53^{b}	11.33±5.30^{b}	3.93±1.79^{a}	16.39±0.03^{a}	0.10±0.01^{a}	1.84±0.04^{a}	0.09±0.02^{a}

Results presented as ± SD, n=3, means with similar letters were significantly different ($p \leq 0.05$).

DISCUSSION

The present study has shown that *Moringa* leaf extract within the period of 15 days is an effective tool for enhancing the germination and plant vigor. As could be clearly seen in the Table 1, M. oleifera boosted the process of seed germination with significant difference ($p \leq 0.05$) amongst the treatments. There was a sharp increase1 in the seed germination percentage early seedling growth of *C. lanatus* at higher rate of the extract concentration (80 and 100 nil of the extract) compared to control and low extract concentration., it is a seed priming tool which can improve germination and plant vigor in vegetables, crop and range grasses (Musa *et al.*1999). Germination rate, fresh shoot and root weight, dry shoot and root weight, stem height and number of leaves are all important contributors to seed vigor. Higher germination rate is the main foundation which ensures an improvement of the overall seedling performance.

The present result indicate that application of *Moringa* leaf extract at 100 % was the most effective concentration and extracted method as depicted by higher emergence rate and better seedling growth of C. lanatus. Applying *Moringa* leaf extract not only promotes germination rate and subsequent growth under cool conditions but also helps in broadening the range of temperature during germination which ultimately enhances crop yield (Zheng*et at.*, 1994).

In Tables 1 & 2, *Moringa* leaf extract enhanced plant growth and development, the result however tallies with the findings of Stephen et al., (2005) who reported that plant growth promoters are manmade compounds that are used in regulating the growth of cultivated plants, weeds and plant cells when

applied by humans in which 100 mls of *Moringa* leaf extract was more effective in broadening the number of leaves, increasing the stem height (cm), shoot fresh and dry weight (g). The results equally corroborates the report of Basra et al. (2009), on the effect of *Moringa* oleifera leaf extract on boosting the growth of maize plants successfully.

Moringa leaf extract is a rich source of PGR hormone, zeatin, ascorbic acid, calcium and potassium, winch are involve in several plant growth and development processes, Cytokinin often plays it role by interacting with other plant hormones like auxins and abscisic acid. Iftikhar (2009) observed increased emergence and vigorous plant development in maize seeds primed with *Moringa* leaf extract (1:30),due to the presence of calcium, potassium, ascorbic acid and cytokinin hormone. In a similar study, Foidl*et al.* (2001) reported a significant effect on almost all plants with application of Moringa extract at different concentrations. *Moringa* leaf extract are organic and inexpensive, it is more effective than other priming strategies in which expensive salt or synthetic PGRs are used. These finding open new doors for plant researcher to explore natural and organic sources as priming agent;

CONCLUSION

Cultivation of watermelon is of great importance science it serves as source of food and provides several medicinal uses. It is also the most refreshing thirst quenching fruit for all.

Moringa oleifera leaf extract is an effective alternative used for promoting plant growth; it is not only organic but also inexpensive, easily adapted and environmentally friendly. Growth promoters of *C. lanatus* such as stem height, number of leaves, shoot and root fresh weight, shoot and root dry weight,

responded significantly with the application of *Moringa* leaf extract at different concentrations. It also had a significant effect on the germination rate of *C. lanatus*.

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