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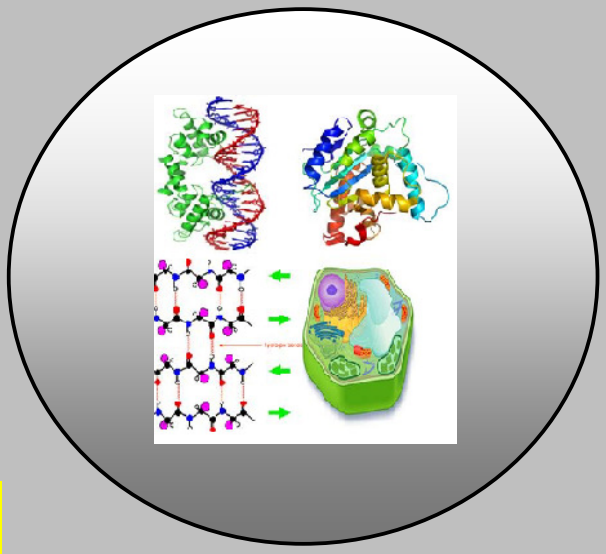

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RESEARCH PAPER
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Assessment in the Variations of Water Uptake of two horticultural Crops *Amaranthus* and *Celosia* at Federal University of Agriculture, Abeokuta, Nigeria

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ABSTRACT

An experiment was carried out at the green house of the college of environmental resources management at the Federal University of Agriculture Abeokuta, Ogun state to assess the variation in the uptake of water of two horticultural crops: Amaranthus and Celosia. The experiment was laid out in a completely randomized design (CRD) and was replicated three times with a control. 0.75litres of water was applied to the crops at a day interval. Data collected were analyzed and student t-test was used to compare the means of the crops planted as a sole and as an intercrop and the test was also used to formulate three hypotheses. The result of the analysis of the T-test of the uptake of water on the mean values of sole crop of Amaranthus and Celosia and their intercrop at 95% confidence level while the degree of freedom(t58) was between 2.002 and 2.002 showed that the calculated value is greater than the tabulated value. The result showed that there were significant differences between the uptake of water in the different crops and the inter-crop.

Keywords: intercropping, pure stands, sole, significant level, growth parameters.

INTRODUCTION

Water is one of the most important inputs essential for the production of crops. Plants need it continuously during their life and in huge quantities. Water relation models are essential component of all crops because of the critical role that water plays in determining growth productivity and produce quantity. It influences profoundly photosynthesis, respiration,

absorption, translocation and utilization of mineral nutrients and cell division besides some other processes (Jarvis, 1988). Both its shortages and excesses affects the growth and development of a plant directly and consequently, its yield and quality. Rainfall is the cheapest source of natural water-supply for crop plants. Its frequency distribution and amount are not in accordance with the needs of the crops. The importance of water to horticultural crops is particularly great because most horticultural produce is sold by weight with water being the major component, even more importantly, however, there is an increasing recognition by producers of the need for high quality produce if the highest market prices are to be achieved, with textural properties, so there is often a marked premium in ensuring that water content is optimized often through precise control of irrigation. Water affects the performance of crops generally not directly but also indirectly by influencing the availability of other nutrients, the timing of cultural operations etc. and other production input interact with one another in proper combinations the crop yield can be boosted manifold under irrigated agriculture (Jones and Tardieu., 1997).

Horticultural crops demand and require significant amount of water due to their perishable nature. Horticultural crops does not only comprises of large amount of water, since water is such critical component of growth and development of crops, horticultural crops cannot be established without full uptake of water. Normally large amount of water per minute is required for horticultural crops, (Mc Eachern et al., 1996).Water affect the performance of crops not only directly but also indirectly by influencing the availability of other nutrients, the timing of other input operation etc. water and other production input interact with one another in proper combination the crop yield can be boosted manifold under irrigated agriculture, as in all crops the maintenance of an adequate water supply is crucial to obtaining maximum productivity of horticultural crops. Water also provides the medium for long distance transport of nutrients and growth regulatory compounds about plant both in the phloem and xylem. In horticultural crops, there is further reason for the importance of water because most of the crops are sold by weight and since water is the major component of most fresh horticultural commodities there is often a marked premium in ensuring that water content is maximized while ensuring that produce quality does not suffer (Marcelis et al., 1998).

The study examined two horticultural crops carried out at the Federal University of Agriculture Abeokuta. These are: *Amaranthus* and *Celosia* specie.

***AMARANTHUS*:** *Amaranthus* belongs to the family of Amaranthaceae of sub-family Amaranthoidea (Lenz 1859). The genus consists of more than 60 species that can be broadly categorized into grain, green leaf vegetable and weed types. Amaranths are the most commonly grown vegetables of low land tropics in Asia and Africa. (Australian New crops 1999).

***CELOSIA*:** Celosia is a small genus of plant that contains a small number of different spp. All plant contained within the genus are edible and attractive to look at, which make popular in gardens around the world. The plants are also used for medicinal purposes in certain type of alternative treatments.

According to some botanist, the plants are separated into two categories; those with the bright flower and those without. Some common names for the genus include wool flower and cockscomb. Plants of the celosia genus grow in a number of places around the world. Some of the places where the plants most commonly found include Africa, S/Africa and some region of Asia.

Horticultural crops requires optimum water condition and they are nourished naturally with uptake of water because water influences photosynthesis, respiration, translocation, and utilization of mineral nutrients and cell division besides other processes, it is therefore necessary to assess the uptake of water of horticultural crops. The knowledge of this will help us to know if horticultural crops are performing at its best or not. The study therefore assessed the uptake of water in the two horticultural crops.

This project was carried out at the green house of the college of environmental resources at the Federal University of Agriculture Abeokuta (FUNAAB), located in the south western part of Nigeria. It is in derived savannah zone of the country and falls within (longitude 30 24" and 3026", latitude 70 13" 30" and 70 14" 30"). Under a controlled condition the plot size is 2 meters.

The experimental treatments were; Seeds of *Amaranthus* in pure stand, Seeds of *Celosia* in pure stand, Seeds of *Amaranthus* and *Celosia* in intercropping, Application of water at different levels and the control. The experimental design was both the amaranth and celosia were grown in a completely randomized design with replicates seeds were sown in plastic bags.

Data on morphological trait were collected from the plants using meter rule and weighing lysimeter. The morphological traits are the following:

Plant height: The height was measured from the inflorescence top of the plant to the soil surface in centimeters (cm).

Plant weight: The total weight of the plant was measured with weighing lysimeter and recorded.

Number of leaves: The number of leaves of the selected plant were counted and recorded.

Days to flowering: observed as the numbers of days to when all the plant in the experiment flowered.

DATA ANALYSIS

Data collected was analyzed using the Student t- test. Three hypotheses was formulated and tested. The hypotheses are as follows:

Hypothesis 1: Is there any significant difference between the means of the water uptake of *Amaranthus* and *Celosia* at 0.05 significant levels.

H_0: There is no significant difference between the means of the uptake of *Amaranthus* and *Celosia* at 0.05 significant levels.

H_1: There is significant level between the means of the uptake *Amaranthus* and *Celosia* at 0.05 significant levels.

Hypothesis 2: Is there any significant difference between the means of the water uptake of *Amaranthus* and the intercrop of *Amaranthus* and *Celosia* at 0.05 significant levels.
H_0: There is no significant difference between the means of the uptake of *Amaranthus* and the intercrop of *Amaranthus* and *Celosia* at 0.05 significant levels.
H_1: There is significant difference between the means of the uptake of Amaranthus and the intercrop of *Amaranthus* and *Celosia*.
Hypothesis 3: Is there any significant difference between the means of the water uptake of *Celosia* and intercrop of *Amaranthus* and *Celosia* at 0.05 significant levels.
H_0: There is no significant difference between the means of the uptake of *Celosia* and the intercrop of *Amaranthus* and *Celosia* at 0.05 significant levels.
H_1: There is significant difference between the means of the uptake of *Celosia* and the intercrop of *Amaranthus* and *Celosia* at 0.05 significant levels.

RESULT

The result and discussion is based on the assessment of the variation of water uptake in two horticultural crops *Amaranthus* and *Celosia*. The result of variation of water uptake in sole *Amaranthus* and sole *Celosia* is presented in table 1 below.

DISCUSSION

The study examined the uptake in two horticultural crops with three treatments of sole *Amaranthus*, sole *Celosia*, and the intercrop between *Amaranthus* and *Celosia*. The result of the study revealed that uptake of water is highest in the intercrop treatment than in the sole treatment. This implied that water that was applied to both the intercrop treatment and the sole treatment was quickly used up by the intercrop plant than the sole plant; thereby leading to insufficient of water in the intercrop treatment and thus making the sole crop that had adequate water to showed vigorous growth compared to the intercrop.
Also, the sole crop treatment has the highest effects on the growth parameters compared to the intercrop and this is attributed to the fact that adequate soil moisture had effect on vegetative development, because the amount of water available in plant does affect the growth of plant. This is in conformity with the observation of Bates and Hall, (1982) who posited that plant with small supply of water will often grow very slow and stay small. They also tend to have smaller leaves as approximately 90% of water absorbed by a plant is lost to through evaporation. This observation is in agreement with the evidence reported by (Moormann and Kang, 1978), that moisture affects the growth, and the variation in crop yield has often related to variation in moisture content.
The plant height of the intercrop reduced compared to the sole crop due to inadequacy of light, space, and water and there was competition between the plants. This reduced the photosynthetic rate of the plant and thus decreased the plant height. This is in agreement with the observation showed by (Anyian and Herzog, 2004) who reported that under water deficit condition, plant height and leaf area was shapely reduced as a result of leaf growth reduction and abscission.

The compares of the variation of the uptake of water showed that there exist a difference between the rate of uptake of water in the sole crop of *Amaranthus* and *Celosia* and their intercrop, which means that plant in the sole crop will grow more than plant in the intercrop because of availability of much space, light and water in the sole crop.

Therefore, in order to achieve a better yield of the intercrop of *Amaranthus* and *Celosia* adequate amount of water must be supply to the crop in order to increase soil moisture which is needed for rapid growth of the plant. This is evident from the result obtained from the experiment carried out. Farmers that practice rain-fed agriculture should ensure that there is enough water for their crops, especially when inter-dropping.

Table 1. Variation in water uptake between the three treatments *Amaranthus*, Celosia and *Amaranthus*/*Celosia*.

Date	Sole *Amaranthus*	Sole *Celosia*	Intercrop *Amaranthus/Celosia*
30/4/12	0.16	0.09	0.23
02/5/12	0.4	0.3	1.05
04/5/12	0.26	0.11	0.3
06/5/12	0.3	0.2	0.6
08/5/12	0.35	0.26	0.6
10/5/12	0.16	0.08	0.7
12/5/12	0.08	0.07	0.6
14/5/12	0.08	0.12	0.25
16/5/12	0.3	0.22	0.38
18/5/12	0.49	0.38	0.6
20/5/12	0.26	0.23	0.55
22/5/12	0.42	0.18	0.75
24/5/12	0.3	0.23	0.49
26/5/12	0.45	0.38	0.75
28/5/12	0.15	0.08	0.25
30/5/12	0.16	0.09	1.3
02/6/12	0.14	0.11	0.35
04/6/12	0.13	0.08	0.18
06/6/12	0.18	0.11	0.24
08/6/12	0.26	0.18	0.4
10/6/12	0.33	0.3	0.6
12/6/12	0.3	0.25	0.48
14/6/12	0.12	0.09	0.17
16/6/12	0.16	0.12	0.22
18/6/12	0.11	0.08	0.15
20/6/12	0.12	0.08	0.15
22/6/12	0.12	0.09	0.18
24/6/12	0.12	0.09	0.13
26/6/12	0.1	0.07	0.13
28/6/12	0.11	0.08	0.13

Table 1, shows that the trend in the uptake of water between the means of the three treatments *Amaranthus*, *Celosia* and the intercrop of *Amaranthus*/*Celosia* varies. The table above showed that uptake of water in the intercrop is highest. Water uptake in the sole *Amaranthus* is higher compared to uptake of water in sole *Celosia*. This implied that the rate of water uptake between the three treatment varies with time therefore there is a difference between the uptake of their means.

The result of variation of water uptake between the three treatments (*Amaranthus*, *Celosia* and *Amaranthus*/*Celosia*) is shown in figure 1 below.

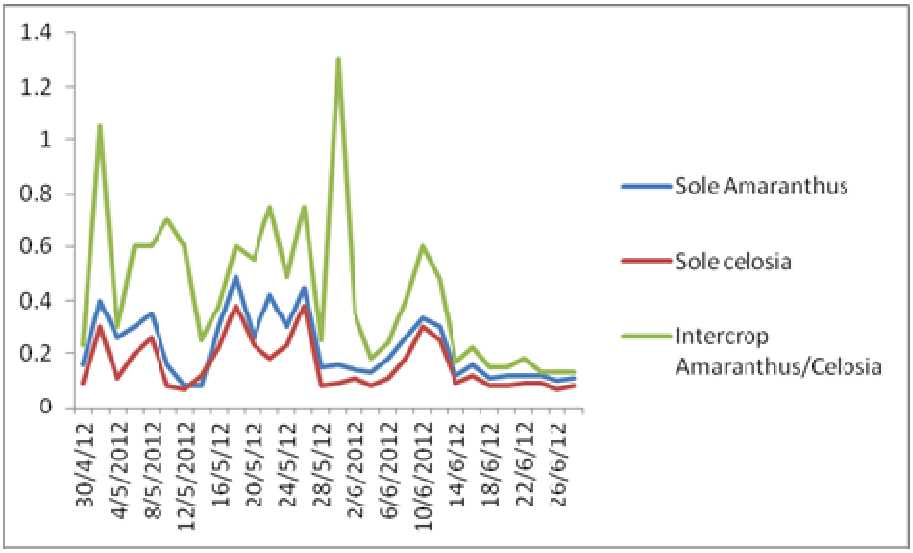

Fig 1. Variation in water uptake between the three treatments *Amaranthus*, *Celosia*, and *Amaranthus / Celosia.*

Figure 1 above showed the rate of uptake of water between the three treatments of *Amaranthus*, *Celosia* and the intercrop of *Amaranthus*/*Celosia*. From the figure above, it was observed that there is no much difference in the trend of uptake of water between the sole *Amaranthus* and sole *Celosia*, the trend was the same from the 30th of April to 12th of May. For the intercrop, it has been observed that it was greater than the sole *Amaranthus* and sole *Celosia*. At the beginning of the planting period, the water uptake for the intercrop rose to a semi-peak that is between 30th of April to 4th of May. In the period from the 4th of April to 28th of May, the uptake of water was higher than that of sole crops. There was a peak uptake between 28th of May and 6th of June.

Hypothesis 1 examined in the variation of the uptake of water in *Amaranthus* and *Celosia*. The null hypothesis was rejected, this implied that there is significant different between the mean value of water uptake between *Amaranthus* and *Celosia*. Hypothesis 2 examined the variation of uptake of water between *Amaranthus* and the intercrop of *Amaranthus* and *Celosia*. The null hypothesis was rejected. This implied that there is significant different between the mean value of water uptake between *Amaranthus* and the intercrop of *Amaranthus* and *Celosia*.

Hypothesis 3 deals with the variation in the uptake of water in *Celosia* and the intercrop of *Amaranthus* and *Celosia*. The null hypothesis was also rejected. This also implied that there is significant difference between mean value of the uptake of water between *Celosia* and the intercrop of *Amaranthus* and *Celosia* at 0.05 significant levels.

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