

EFFECT OF IRRIGATION SYSTEMS ON YIELD AND WATER USE
OF OKRA AND *AMARANTHUS HYBRIDUS*.

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TP/03/04/H/1430

B. Tech (Agricultural Engineering) F.U.T.A

A THESIS SUBMITTED TO THE DEPARTMENT OF AGRICULTURAL
ENGINEERING
FACULTY OF TECHNOLOGY,
OBAFEMI AWOLOWO UNIVERSITY,
ILE-IFE, NIGERIA.

IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR
THE AWARD OF DEGREE OF MASTER OF SCIENCE (M.Sc)
AGRICULTURAL ENGINEERING.

JANUARY 2007.

ABSTRACT

The study investigated the growth and yield of okra and *Amaranthus hybridus* under four irrigation systems, in order to determine the most economical system in terms of water use efficiency, cost inputs, and optimal crop yield.

Four irrigation systems, namely, sprinkler, drip, basin and furrow systems were designed and established for the study. The research was carried out using a completely randomised block design of 4 treatments and 3 replicates giving a total of 12 sub-plots with each sub-plot measured 10 m x 8 m. Irrigations were carried out when the available water at the crop root zone depleted to 50% of the soil moisture at field capacity. The soil moisture was monitored using the gravimetric sampling method. Pan evaporation method and the Penman equation were used to determine evapotranspiration. The plant height, leaf counts, leaf area, leaf area index and yield components were measured at different stages of plant growth. The data obtained were subjected to descriptive and inferential statistical analysis to compare crop performance under the different irrigation systems. Engineering economic analysis of growing okra and *Amaranthus hybridus* under the different irrigation systems was also carried out.

The results indicated that okra and *Amaranthus hybridus* responded well to drip irrigation system when compared to other systems. Drip system gave the largest leaf area of 56.23 cm² at the end of the third week of the planting. The least leaf area was observed in *Amaranthus hybridus* grown under the furrow irrigation system. The difference in leaf area of *Amaranthus hybridus* grown under all the irrigation systems was significant (P<0.05, F=163.38). The highest yield (1875 kg/ha) of *Amaranthus hybridus* was obtained under the drip irrigation system, while the least

(1250 kg/ha) was obtained under furrow irrigation system. A similar trend was obtained for okra, with the highest and least yield of 1551 kg/ha and 972 kg/ha for drip and furrow systems, respectively. The total irrigation water applied to *Amaranthus hybridus* under the sprinkler, drip, basin and furrow systems was 53, 49, 91 and 74 mm, and these gave water use efficiencies of 32.5, 38.0, 15.2 and 16.9 kg/mm, respectively. The benefit-cost ratios were 0.6, 1.0, 0.7 and 0.7, for sprinkler, drip, basin, and furrow irrigation systems, respectively. On okra plots, the water use efficiency of total irrigation values applied for sprinkler, drip, basin and furrow systems were 3.9, 5.7, 2.4 and 2.2 kg/mm, respectively. The benefit-cost ratios were calculated to be 0.5, 1.1, 0.8 and 0.7 for sprinkler, drip, basin and furrow irrigation systems in that order. The cost recovery factor ratio was 4.2, the annual energy cost factor 1.0008, and the annual depreciation cost was N215.08.

The study concluded that drip irrigation system was the best in terms of benefit - cost ratio, yield and water use efficiency for both crops.