# EVALUATION OF SEVEN GROUNDNUT (Arachis hypogeae L.) CULTIVARS FOR YIELD RESPONSES IN BENUE STATE,NIGERIA

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## I. INTRODUCTION

Groundnut (Arachis hypogaea L.) is a leguminous crop and belongs to the Family fabaceae (Wikipedia, 2010). It is the 13 most important food crop and 4 most important oilseed crop of the world (Kees Stigter,2011).Groundnut is grown in 23.95million hectares with a total production of 36.45million metric tons and average yield of 1520kg/ha in 2009(FAO,2011).Major producing countries are: China,40%; India,16.4%; Nigeria, 8.2%; USA,5.9% and Indonesia,4.1%.Biotic and abiotic factors are major production constraints in Nigeria and elsewhere.

Groundnut seeds contain 40-50% fat, 20-50% protein and 10-20% carbohydrate. The seeds are also nutritional source of vitamin E, niacin, folacin, calcium, phosphorus, magnesium, zinc, iron, riboflavin, thiamine, and potassium (Adeyeye and Ajewole, 1992). Groundnut seeds are consumed directly in raw, roasted or boiled form. Oil extracted from kernels is used as culinary oil, animal feed and industrial raw material (oil cakes and fertilizer). These multiple uses of groundnut plant makes it an excellent cash crop for domestic markets as well as for foreign trade in several developing and developed countries (Kees Stigter, 2011).

A rapid decline in groundnut production from 1975 to date due to biotic and abiotic factors, and neglect of agriculture due to over dependence on petroleum products has been observed. A large proportion of farmers still depend on the informal seed system, using farm-saved seeds or seeds obtained from their neighbours.The result of these shortcomings is that the demand for high quality seeds and high yielding cultivars in Nigeria is largely not satisfied.Groundnut protein is increasingly becoming important as food and feed sources especially in developing countries where protein from animal sources is not within the means of majority of the populace.

The performances of different cultivars of groundnut need to be evaluated across locations in the Southern Guinea Savanna agro-ecological zone of Nigeria(Benue State).The objectives of this study were therefore: to investigate the yield response of groundnut cultivars under the environmental conditions of Makurdi and Yandev locations in the Southern Guinea Savanna agro-ecological zone of Nigeria and to identify the best cultivar(s) to meet the market demand.

## II. MATERIALS AND METHODS

### Experimental Site

Field studies were conducted at Makurdi and Yandev locations of Benue State in 2011 and 2012 cropping seasons.These locations fall within the Southern Guinea Savanna agro-ecological zone of Nigeria(Kowal and Kassan,1979; Agboola,1979).Random soil samples were taken from the experimental plots before sowing and were dried under sun and run through a 2mm sieve and intimately mixed for mechanical and chemical analysis according to the procedure of IITA(1995) at NICANSOL soil testing laboratory,University of Agriculture, Makurdi.

### Materials

Seeds of the groundnut cultivars: Samnut-16, Samnut-21, and Samnut-23 were obtained from Institute of Agricultural Research(IAR), Samaru-Zaria; Borno Red and Bomboyo from Maiduguri; Ebunaigbaji and Ijiwanda were obtained from Oju Local Government area of Benue State. The seven groundnut cultivars were purchased in 2010 and kept in a well ventilated store for use in 2011.

### Methods

The experimental site was cleared and ridges 0.5m apart were prepared manually at both locations. Two seeds were planted per hole and spaced 75cmx20cm between plants with a population density of 66,000 plants per hectare. Thinning to one seedling per stand was done two weeks after sowing.The experiment was laid out in Randomized Complete Block Design with three replications.The gross plot size was 25mx12m(300m), with net plot size of 3mx3m(9m).The plots were weeded manually twice, before and after flowering at 4 and 8 weeks after sowing.The plants were sprayed fortnightly with permethrin (sheper) insecticide at the rate of 1.1kg a.i. chemical per 15litres of water starting from 4WAS to minimize insect damage by leaf rollers, grasshoppers and aphids.

Five plants from each net plot were tagged randomly for recording yield parameters which include: number of mature pods per plant ,pod weight per plant, number of seeds per plant, seed weight per plant, number of unproductive pegs per plant, pod yield, number of immature pods per plant, and seed yield per hectare as follows:

Number of Mature Pods Per Plant: The groundnut cultivars were harvested when they attained physiological maturity and the number of mature pods were counted and recorded per plant and per cultivar.

Pod Yield Per Plant(g): After harvest, pods were allowed to dry for two weeks. Thereafter, pod weights from randomly selected plants from each cultivar were taken and pod weight per plant was determined by average and recorded.

Shelling Percentage: After harvest and at two weeks of drying,100pods were randomly selected from each cultivar and weighed. Shelling percentage was recorded from 100 pod weight. 100 Seed Weight(g): One hundred seeds were randomly selected from each cultivar at two weeks after harvest, and weighed to determine 100 seed weight.

Haulm Weight Per Plot(kg): Groundnut plants were harvested and allowed to dry for two weeks. Weight of haulms for three net plots per cultivar was taken and haulm weight per plot determined by average and recorded.

Seed Weight Per Plant(g): Seeds per plant and per cultivar were weight from five randomly selected plants two weeks after harvest, and seed weight per plant was determined and recorded.
Number Of Unproductive Pegs Per Plant: At two weeks after harvest, five plants were labeled from each cultivar, number of unproductive pegs were counted and average taken to determine number of unproductive pegs per plant.

Pod Yield(kg/ha): Pod yield from five randomly labelled plants from each variety was determined and average taken to record pod yield per plant. This value was multiplied by 66,000(number of plants per hectare at 75cmx25cm spacing) to determine pod yield per hectare.

Seed Yield( kg/ha): Seed yield per plant was determined by weighing seeds of five labelled plants per variety and finding the average. By multiplying the value by 66,000 plants, seed yield per hectare was determined and recorded.

Statistical Analysis

The data collected was analysed statistically using the Analysis of Variance Procedure(ANOVA) described by Steel and Torrie(1980). Treatment effects were compared by the Fischer's Least Significant Difference Procedure(F-LSD) at 5% level of probability. Procedure by GenStat Release, Version 2009 was used.

## III. RESULTS

Number Of Mature Pods Per Plant

Results on number of mature pods per plant are presented in Table 1.There were significant differences in number of mature pods among the seven cultivars of groundnut. In Makurdi location, Samnut-21 produced significantly higher number of pods(42.90) compared to other cultivars. In Yandev location, Bomboyo recorded higher pod number(31.70) which differed significantly compared to other cultivars, except Ijiwanda.

Pod Weight Per Plant(g)

Table1 shows that, in Makurdi and Yandev locations, significant differences in pod weight among the groundnut cultivars were observed. Samnut-21 produced higher pod weight(69.93g) in Makurdi location, which differed significantly from other cultivars. Borno Red gave lower pod weight(15.12g). Pod weight(37.41g) produced by Bomboyo in Yandev location was significantly higher than pod weights of other cultivars except Ijiwanda.

Shelling Percentage(%)

The difference in shelling percentage among the seven groundnut cultivars was not significant in Makurdi location(Table1). In Yandev location higher shelling percentage was observed with cultivar Bomboyo(71.81%) and this was significantly different compared to Samnut-21, Samnut-23 and Ebunaigbaji, which had the least(62.62%).

100 Seed Weight(g)

Results on 100 seed weight are summarized in Table2. Under Makurdi conditions, Samnut-23 had significantly higher 100 seed weight(67.00g) compared to other cultivars except Samnut-21. Borno Red gave lower 100 seed weightof 37.60g. Results from Yandev location showed that Samnut-16 recorded 100 seed weight of 54.50g which was significantly higher than that of other cultivars except Samnut-21 and Samnut-23. Lower 100 seed weight was observed with Borno Red(34.10g).

Haulm Weight Per Plant(kg)

The seven groundnut cultivars differed significantly in haulm weight in Makurdi and Yandev locations(Table2). Samnut-16 and Samnut-23 produced haulm weights of 11.17kg and 8.47kg in Makurdi and Yandev locations respectively, which were higher and differed significantly when compared to Borno Red, Bomboyo and Ijiwanda cultivars in both locations. Ijiwanda gave lower haulm weight of 2.87kg which was observed in Yandev location.

Seed Weight Per Plant(g)

Results on weight of seeds per plant(Table2) showed that in Makurdi location, Samnut-16 produced significantly higher seed weight(12.86g) than Borno Red(8.41g) which was the least. In Yandev location, higher seed weight was also observed with Samnut-16(21.36g) and this differed significantly compared to other cultivars except Ijiwanda. The weight of Borno Red seeds (7.85g) was lower than weights of other cultivars.

Number Of Unproductive Pegs Per Plant

Results on unproductive pegs are shown in Table 3. Cultivar Ijiwanda recorded significantly higher number of unproductive pegs(57.2 and 36.9) in Makurdi and Yandev locations respectively when compared to other cultivars except Bomboyo(34.9) in Makurdi and (33.5) in Yandev locations. Ebunaigbaji produced lower unproductive pegs(13.5) in both locations.

Pod Yield (kg/ha)

Significantly higher pod yield(4615.38kg/ha) was observed with Samnut-21 in Makurdi location when compared to pod yield of other cultivars(Table 3). Borno Red gave lower pod yield of 997.92kg/ha. Under Yandev conditions, cultivar Bomboyo was significantly higher in pod yield(2469.06kg/ha) compared to other cultivars except Ijiwanda(2301.42kg/ha). Ebunaigbaji recorded lower pod yield of 821.70kg/ha in both locations.

Number Of Immature Pods Per Plant

Table 3 shows results on number of immature pods per plant in Makurdi and Yandev locations. Ijiwanda under Makurdi conditions yielded significantly higher number of immature

pods(10.90) compared to Ebunaigbaji(3.80) which had the least. Ijiwanda also produced higher number of immature pods(8.53) in Yandev location which differed significantly from immature pods produced by Samnut-23(3.93) and Ebunaigbaji(3.47)

Number Of Primary Branches

Results on number of primary branches at 20,40 and 60 DAS are summarized in Table 4. At 20 DAS in Makurdi location, Samnut-23 recorded significantly higher number of branches(7.00) compared to Borno Red, Bomboyo and Ijiwanda. At 40 DAS , Samnut-16 and Samnut-23 had 7.67 branches which was significantly higher and different from Borno Red and Bomboyo cultivars. While at 60 DAS, Samnut-16 produced significantly higher number of primary branches(7.67) compared to Borno Red and Bomboyo. Thus, Borno Red and Bomboyo produced lower number of primary branches(4.93) and (5.20) respectively in both locations. In Yandev location at 20, 40 and 60 DAS, Samnut-23 recorded 8.20, 9.93, and 10.00 branches respectively which were significantly higher and different compared to other cultivars except Samnut-16. At all sampling times, Borno Red and Bomboyo recorded lower number of primary branches.

Number Of Secondary Branches

In Makurdi location at 20DAS, Samnut-21 gave 13.33 secondary branches which was significantly higher than that of Borno Red and Bomboyo cultivars(Table 5). Samnut-23 at 40, and Samnut-21 at 60 DAS produced significantly greater number of secondary branches(20.67 and 29.00) respectively than Borno Red, Bomboyo, Ijiwanda and Ebunaigbaji cultivars. Results in Yandev location showed that higher number of secondary branches were observed with Ebunaigbaji at 20 DAS (14.67) ; Samnut-21 at 40 DAS(14.00) ; and with Samnut-16 at 60 DAS(16.00), and these were significantly different compared to Borno Red, Bomboyo, and Ijiwanda cultivars. Ijiwanda recorded lower number of secondary branches at all sampling times in Yandev location.

## IV. DISCUSSION

Samnut-23 produced significantly higher number of primary and secondary branches compared to other cultivars. Based on this growth habit, Samnut-23 could be classified as the bunch type, while Borno Red, Bomboyo and Ijiwanda are the open or non bunch types. On the other hand, Samnut-21 and Ijiwanda gave higher number of mature pods than Samnut-16, but Samnut-16 produced higher seed yield than Samnut-21 and Ijiwanda. Samnut-16 with lower mature pods produced greater number of seeds per pod which led to higher seed yield. Samnut-16 could be classified as the high yielding cultivar.

Khangara and Sandhu(1972) found a strong positive correlation between number of primary and secondary branches. They emphasized that length of primary branch is the most important character having direct effect on pod yield.

## AUTHORS

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