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EFFECT OF INTRA-ROW SPACING AND VARIETY ON GROWTH AND YIELD OF ONION (*Allium cepa L.*)

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ABSTRACT

Experiments were carried out at the Usmanu Danfodiyo University Teaching and Research *Fadama* Farm, Sokoto during 2005/2006 and 2006/2007 dry seasons to determine the effects of inter-row spacing and variety on growth and yield of bulb onion under irrigation. The treatments consisted of four intra-row spacing (10, 15, 20 and 25cm) and two onion varieties (Solara and Ex-maganawa). The treatments were factorially combined and laid out in a randomized complete block design (RCBD) replicated three times. Results obtained revealed that there was significant effects ($P<0.05$) of intra-row spacing and variety on the parameters investigated. The highest total biomass weight (53.33t/ha) was obtained from 15 cm intra-row spacing and ex-maganawa variety recorded the highest biomass weight (48.40 t/ha). Cured bulb yield was highest when 15cm intra-row spacing was used and ex-maganawa variety out yielded Solara. Interaction between variety and intra-row spacing was not significant for most parameters examined with the exception of fresh and cured bulb yields.

Keywords*:* Onion; Intra-row spacing; Variety; Growth; Yield

INTRODUCTION

Onion (Allium cepa L.) is a member of Alliacea family that is usually grown as an annual. It is by far the most important of all the cultivated verities that fall in the genus allium. Onion is one of the most important vegetable crops in Nigeria where it is an important condiment in the preparation of curry, spicy dishes. The culinary uses of onion are numerous. Both matured and immatured onions are eaten; they are important in flavoring stews and are prepared in a variety of ways such as fried, boiled ad roasted (Koccher, 1986). Onion production in Nigeria is confined to the northern guinea and Sudan savannah zones.

Various research findings indicated that population density greatly affects growth and yield of crops in general and onion in particular. Amans *et al*. (1996) reported intra-row spacing to have affected yield and yield attributes in onion. Gupta and Guffer (1980) reported yield increase with increased in the plants density up to a certain limit. Also Kumar *et al.* (1998) obtained the highest yield of onion where a close spacing was used. Khan *et al.* (2002) and Resende *et al*. (2005) reported a linear reduction in non commercial bulbs as intra-raw spacing was increased.

Many onion cultivars are limited in their range of adaptation due to the combined effect of photoperiod and temperature. Many of the cultivars bred in temperate countries will not form bulbs in the tropics as the day length is too short. Cultivars also differ in their susceptibility to bolting which is induced by low temperatures. Cultural practices such as date of planting, propagation method and spacing may help in the success of a cultivar. Purseglove (1972) suggested that it is essential that cultivars should be carefully tested under local conditions to ascertain their sustainability.

It is in realization of these aforementioned facts, that this research work was initiated to determine the optimum intra-row spacing to be used and the best variety to be grown for optimum yield of onion under Sokoto conditions.

MATERIALS AND METHODS

The experiments were conducted during 2005/2006 and 2006/2007 dry seasons at the Usmanu Danfodiyo University Teaching and Research Fadama Farm located on latitude $13^{o}9^{1}$ and longitude $5^{o}13'$E, 300m above the sea level to investigate the effect of intra-row spacing and variety on growth and yield of onion.

The treatments consisted of four intra-row spacing (10, 15, 20, and 25cm) and two varieties of onion "Solara" and "Ex-maganawa". The treatments were factorially combined and laid out in a Randomized Complete Block Design (RCBD) replicated three times. Fertilizer NPK (15:15:15) was applied at the rates of 80kgN/ha, 40kg P and K respectively. Inter-cultural operations were done as and when necessary. Ten plants were selected randomly for recording the necessary agronomic data viz: total biomass weight (t/ha), above-ground biomass (t/ha), fresh bulb (t/ha), mean bulb diameter and cured bulb yield (t/ha). Data obtained were analyzed using SAS (Statistical Analysis System) package and significantly different means were separated using Duncan's Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

Effect of Intra-row Spacing

Results from this investigation revealed that intra row spacing significantly ($P<0.05$) affected the total biomass, fresh and cured bulb yield and also mean bulb diameters as shown in Table 1. It showed that 15cm intra-row spacing gave the highest total biomass (53.33t/ha) which was followed by 20cm (47.15 t/ha). This could be probably because intra-row spacing of 15cm was the optimum for growth and development of onion and therefore, the crop had the best chance to utilize the available resources efficiently. This finding was buttressed by the report of Obinne (1984), who argued that, for commercial onion production, onion should be spaced 15cm apart.

Though statistically at par, the effect of intra–row spacing on the above ground biomass showed that 15cm intra-row spacing was slightly higher than the rest used.

Intra-row spacing was found to have a significant effect ($P<0.05$) on fresh bulb weight with 15cm having the highest value (42.44 t/ha) which was followed by 20cm (37.15 t/ha). The higher value recorded by 15cm spacing could be attributed to its suitability with respect to growth and development of onion as reported by Rhind (1977). He maintained that, onion should be spaced 15cm to give the most acceptable bulb size and weight.

Table 1: Effect of intra-row spacing on the growth and yield of onion at Sokoto

Intra-row spacing (cm)	Total biomass (t/ha)	Above ground biomass (t/ha)	Fresh bulb yield (t/ha)	Cured bulb yield (t/ha)	Mean bulb diameter (cm)
10	42.08c	8.40	33.68b	32.08c	11.06d
15	53.33a	10.89	42.44a	39.68a	12.19abc
20	47.15b	10.00	37.15ab	36.97ab	12.34ab
25	45.46bc	9.55	33.91b	30.84cd	12.79a
SE±	0.684	Ns	0.489	0.505	0.326

Means in a column followed by same letter(s) are not significantly different (P>0.05); Ns=not significant.

Similarly the effect of intra-row spacing on the bulb diameter was significant. 25cm spacing gave the highest value of 12.79 cm (12.78 cm), while 10 cm intra-row spacing recorded the smallest bulb diameter. The bigger bulbs obtained from 25cm spacing could be as a result of less competition for space and nutrients and ability to adjust its bulb size. This is in conformity with the reports of Amstet *et al.* (1980) and Amans *et al.* (1996) who observed that onion responded to spacing by adjusting its bulb size.

Effect of intra-row spacing on the cured bulb yield was found to be significant (P<0.05) with the highest yield (39.68 t/ha) obtained from the use of 15cm spacing, which was higher than the value obtained from 20cm spacing (36.97 t/ha). The higher yield recorded by 15cm spacing compared to wider spacing of 20 and 25cm may be due to the fact that the closer spacing had more than compensated for the short fall it suffered at the bulb size parameter. This goes with the reports of Arnon (1972) and Amans (1989) who reported that closer spacing of crop reduces individual plant yield but give more yield on the basis of land area unit compared to the widely spaced ones.

Effect of Variety

Effect of variety was significant (P<0.05) on the total biomass with ex-maganawa having higher value of 48.40 t/ha while Solara recorded 40.67 t/ha total biomass. Similarly, the above ground biomass was significantly (P<0.05) affected by the tested varieties. Variety ex-maganawa had higher value (12.67 t/ha) than solara variety (6.81 t/ha). This was due to the fact that the former had the ability to produce more leaves during vegetative stage, and this was in line with what was reported by Amslet (1980) that variety which produced higher number of leaves was found to have higher above ground biomass.

There was significant effect of variety on the fresh bulb yield (Table 2). Ex-Maganawa variety recorded higher fresh bulb yield (35.73 t/ha) than Ex-Maganawa which recorded (33.86 t/ha). There was no significant effect of variety on cured bulb yield. This means the two varieties tested exhibited similar characteristics in terms of yield under the experimental conditions.

Significantly higher mean bulb diameter was produced by Solara compared to ex-maganawa. This could be as a result of the ability of the former to produce large bulb size. This is in conformity with the report of Aliero (1988) who mentioned that improved varieties out-yield the local varieties and produced bigger bulbs.

Table 2: Effect of variety on growth and yield of onion at Sokoto

Variety	Total biomass (t/ha)	Above ground biomass (t/ha)	Fresh bulb yield (t/ha)	Cured bulb yield (t/ha)	Mean bulb diameter (cm)
Solara	44.67b	6.81b	33.86b	34.84	12.47a
ex-maganawa	48.40a	12.67a	35.73a	34.97	11.72b
SE±	0.483	0.243	0.346	Ns	0.231

Means in a column followed by same letter(s) are not significantly different (P>0.05); Ns=not significant.

Interaction Effects

Interaction between variety and spacing was not significant on total biomass, above ground biomass and bulb diameter, there was significant (P<0.05) interaction effect of variety and spacing on the fresh and cured bulb yield (Table 3). The variety ex-maganawa spaced at 15 cm within the row produced fresh bulb yield of (45.64 t/ha) and the same variety spaced 25cm apart produced the lowest yield (30.48 t/ha). The same trend was maintained for the cured bulb yield where ex-maganawa spaced at 15cm produced the highest yied (41.11 t/ha) while it recorded a yield of (26.53 t/ha) when spaced at 25 cm. Solara variety produced (36.98 t/ha) when spaced 20 cm apart.

Table 3: Effect of interaction between intra-row spacing (cm) and variety on the fresh and cured bulb yield onion at Sokoto

Intra-rowspacing (cm)	Variety	Fresh bulb yield (t/ha)	Curedbulb yield (t/ha)
10	Solara	31.42b	27.46b
10	Ex-maganawa	36.00ab	30.22b
15	Solara	39.24ab	33.02ab
15	Ex-maganawa	45.64a	41.11a
20	Solara	43.42a	36.98ab
20	Ex-maganawa	30.88b	27.72b
25	Solara	37.33ab	32.25b
25	Ex-maganawa	30.48b	26.53b
SE±		2.55s	2.17

Means in a column followed by same letter(s) are not significantly different (P>0.05)

CONCLUSION

From the results obtained in this experiment, it could deduced that growing variety ex-maganawa at an inter-row spacing of 15cm give more returns than growing solara variety under Sokoto conditions.

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