GROWTH AND YIELD OF ONION AS INFLUENCED BY PLANTING DATES AND MULCHING TYPES IN SAMARU, ZARIA

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Abstract

Two trials were conducted at the Teaching and Research Farm of the Institute for Agricultural Research; Ahmadu Bello University. The experiment was laid out in a split plot design replicated three times keeping planting dates of 15th October, 30th October, 14th November and 29th November in the main plot and mulching types; White polythene, Back polythene, Water hyacinth and Control in the sub plots. Bulbs of onion variety 'Red Creole' were planted at a spacing of 25 x 30 cm. Each sub plot size was 1 x 1.5 m. NPK 20-10-10 fertilizer at rates of 150, 100 and 100 kg ha-1 were applied to grow the crop in three split doses. Slight irrigation was given to the crop prior to laying down the mulches in the plotsimmediately after transplanting hand hoeing was done periodically in the control plots. Data were collected on plant height, number of leaves per plant, number of tillers per plant, days to 50 % flowering, number of flowers per plant, bulb yield per plot and bulb yield per ha. Data collected were analysed statistically using analysis of variance technique. Means were separated using Duncan's multiple range test. From the results obtained, it was observed that planting date of 15th October and White polythene mulch significantly produced higher treatment means than the rest of the treatments. On the other hand, planting date of 29th November and the control treatment under mulching types significantly produced lower treatment means among treatments throughout the period of observations.

Keywords: *Onion, mulching, planting date.*

INTRODUCTION

Onion (*Allium cepa* L.) is a one of the major crops among vegetables and is of global importance. It is used in the preparation of curry and pickle. It is an indispensable diet used both by rich and poor people of Nigeria as a condiment, but domestic production is always very low below requirement (Hossain & Islam, 1994). Yields usually vary from 1000 – 1500 kgha^{-1} compared to other countries of the world. The lower yields are attributed to limited availability of good quality seeds and improved varieties (Ali *et al*., 2007). Improved seed varieties would contribute to crop yield up to 30 % (Shaikh *et al*., 2002). Also, soil moisture is one of the most important factors that influences onion yield. Onion requires frequent irrigation as the crop extract very little water from depths below 5 cm; most of the water is within the depth of 30 cm of the soil. Thus upper soil areas must be kept moist to stimulate root growth and provide adequate water for the plant. Mulching with plant residues and synthetic materials is a well established technique for conserving soil moisture in the soil for plant growth and development (Rhu *et al*., 1990; Kashi *et al*., 2004). This trial was undertaken to determine the effect of planting dates and mulching types on the growth and yield of onion in Samaru, Zaria.

MATERIALS AND METHODS

Two trials were conducted at the Teaching and Research Farm of the Institute for Agricultural Research; Ahmadu Bello University, Zaria located on latitude 11^{0}11N', longitude 7^{0}38'E and 686 m above sea level in Northern Guinea Savannah Ecological Zone of Nigeria. The experiment was laid out in a split plot design replicated three times keeping planting dates of 15th October, 30th October, 14th November and 29th November in the main plot and mulching types; White polythene, Back polythene, Water hyacinth and Control in the sub plots. Bulbs of onion variety 'Red Creole' were planted at a spacing of 25 x 30 cm. Each sub plot size was 1 x 1.5 m. NPK 20-10-10 fertilizer at rates of 150, 100 and 100 kg ha-1 were applied to grow the crop in three split doses; the first dose was applied a week before transplanting during land preparation to serve as a starter dose for the crop, while second and third doses were applied four and seven weeks after transplanting respectively. Slight irrigation was given to the crop prior to laying down the mulches in the plots immediately after transplanting; hand hoeing was done periodically in the control plots. Data were collected on plant height, number of leaves per plant, number of tillers per plant, days to 50 % flowering, number of flowers per plant, bulb yield per plot and bulb yield per ha. Data so collected was analysed statistically using analysis of variance technique of (Steel & Torrie, 1980). Means were separated using Duncan's multiple range tests (1955).

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characters of onion in 2010

There was a significant difference among the treatments studied at P = 0.05 on characters due to planting dates (Table 1). 15th October planting date

significantly produced higher treatment means on plant height (39.33 cm) and number of leaves per plant (10.12) over other treatments. 29th November planting date significantly gave lower treatment means on plant height (29.78 cm) and number of leaves per plant (3.58). 15th October, 30th October and 14th November planting dates did not produce any significant difference on number of tillers per plant. However, significant differences were observed between these treatments and 29th November planting date, this treatment significantly produced a lower treatment mean of (3.47). On days to 50 % flowering, there was no significant difference between 15th October, 30th October and 14th November. However, significant difference was observed between these treatments and 29th November planting date on days to 50% flowering.There was a significant difference observed on number of flowers per plant. 15th October planting date significantly produced higher treatment mean of (26.11) over other treatments. The lowest treatment mean (18.42) was produced by 29th November planting date. An increase in the planting date led to a decrease in the value of treatment means from 15th October down to 29th November planting dates. There was no significant difference on treatment means between 15th October, 30th October and 14th November planting dates on number of bulbs per plant. However, there was a significant difference between these treatments and 29th November planting date on treatment means. 29th November planting date significantly produced a lower treatment mean of (1.09). There was equally no significant difference produced between 15th October and 30th October planting dates of treatment means on bulb yield per plot. However, significant difference was observed between these treatments and the rest at P = 0.05. The lowest treatment mean was produced by 29th November planting date as (2.08). Also, on bulb yield per hectare, 15th October and 30th October planting dates were not significantly different on treatment means. There was a significant difference between these treatments and the rest of the two treatments on bulb yield per hectare. 29th November planting date significantly produced a lower treatment mean of (3670 kg) over other treatments in 2010 cropping season. It was evidenced that plants sown earlier on 15th October exhibited superior performance in producing both growth and yield characters. This was due to the fact that there was enough time for plants in this treatment in completing both their growth and developmental stages which enhanced the production and partitioning of photo assimilates, thus an increase in growth and yield characters over the rest of the treatments. Those sown on 29th November had no adequate time to complete their life cycle because the season was almost winding off as there was no enough rainfall to guarantee the survival of plants under this treatment. So, production and portioning of photo assimilates was disrupted by shorter duration of plants in the field, thus resulting into the production of lower mean treatments of characters in this treatment as earlier observed by (Opara-Nadi & Lal, 1987).

Effect of mulching types on growth and yield characters of onion in 2010

There was a significant difference between treatment means on plant height due to mulching type's effect. White polythene significantly produced a higher treatment mean of (42.65 cm) over other treatments. The lowest treatment mean was produced by the control (30.25 cm). There was no significant difference observed between White polythene, Black polythene and Water hyacinth on number of leaves per plant. However, significant difference existed between these treatments and the control. The control significantly produced a lower treatment mean of (5.78) on leaf number per plant among the treatments. There was no significant difference between White polythene and Black polythene on number of tillers per plant (Table 1). However, there was a significant difference between these treatments and the other two treatments on number of tillers per plant. The control treatment significantly produced a lower treatment mean of (1.67) on number of tillers per plant than the other treatments. There was no significant difference between White polythene, Black polythene and Water hyacinth on days to 50% flowering, but significant difference exist between these treatments and the control on days to 50% flowering. The control treatment significantly gave a lower treatment mean of (49.88) among the treatments. There was a significant difference among the treatments on number of tillers per plant. Black polythene significantly gave a higher treatment mean of (33.42), while the control significantly gave a lower treatment mean of (22.90) among all treatments. There was no significant difference between Black polythene, White polythene and Water hyacinth on number of bulbs per plant. However, there was a significant difference between these treatments and the control on bulbs per plant. The control significantly produced a lower treatment mean of (1.08) among the rest of the treatments. There was no significant difference between Black polythene and White polythene on number of bulbs per plot and bulbs per hectare, but significant difference existed between these treatments and the rest of the treatments. The control treatment significantly produced lower treatment means of (2.15 and 3,076 kg), respectively. As observed from the results of the trial, White polythene enhanced the production of higher treatment means over other treatments. This observation may mean that White polythene conserved moisture and is transparent thereby allowing the penetration of light through it which enhanced the photosynthetic activities of plants under this treatment resulting into the production of higher treatment means than the rest of the treatments. In the control treatment, there was

no moisture conservation which the plants under this treatment were denied adequate moisture for normal growth and developmental processes due to excessive evaporation thus resulting into the production of lower treatment means as earlier reported by (Baten *et al*., 1995; Duranti & Cuocolo, 1989).

Effect of planting dates on growth and yield characters of onion in 2011

Table 2 shows that there was a significant difference due to planting dates on plant height and number of leaves per plant. 15th October planting date significantly produced higher treatment means of (41.22 cm and 11.14), respectively. On the other hand 29th November planting date significantly produced lower treatment means of (31.72 cm and 5.48) on both plant height and number of leaves per plant, respectively. There was no significant difference observed on number of tillers per plant, days to 50 % flowering and number of flowers per plant due to planting dates. There was no significant difference between 15th October planting date 30th October planting date and 14th November planting date on number of bulbs per plant. However, there was a significant difference between these treatments and 29th November planting date on the same character. 29th November planting date significantly produced a lower treatment mean of (1.38) among treatments on number of bulbs per plant. Bulb yield per plant and bulb yield per hectare did not show any significant variations on treatment means due to 15th October and 30th October planting dates. However, significant differences existed between these treatments and the rest of the treatments on treatment means. 29th November planting date significantly produced lower treatment means of (3.28 and 3,670 kg) respectively among treatments on bulb yield per plant and bulb yield per hectare. It was evidenced that plants sown earlier on 15th October exhibited superior performance in producing both growth and yield characters. This is because there was enough time for the plants under this treatment to complete both their growth and developmental stages which enhanced the production and partitioning of photo assimilates, thus an increase in growth and yield characters over the rest of the treatments. Those sown on 29th November had no adequate time to complete their life cycle because the season was almost winding off as there was no enough rainfall to guarantee their survival in the field. So, production and portioning of photo assimilates was disrupted by shorter duration under this treatment as experienced by plants in the field, thus lower production of mean treatments of characters as observed by (Opara-Nadi & Lal, 1987).

Table 1: Growth and Yield of Onion as influenced by Planting Dates and Mulching Types at Zaria in 2010

Treatments Planting dates	Plant height (cm)	Number of leaves per plant	Number of tillers per plant	Days to 50 % flowering	Number of flowers per plant	Number of bulbs per plant	Bulb yield per plot (kg)	Bulb yield per ha(kg)
15th October	39.33a	10.12a	4.09a	52.87a	26.11a	2.05a	3.33a	4345a
30th October	35.24b	7.98b	4.04a	54.04a	23.35b	1.89a	3.24a	4287a
14th November	32.45c	5.67bc	3.98a	54.34a	23.22b	1.64a	2.20b	3891b
29th November	29.78d	3.58c	3.47a	50.33b	18.42c	1.09b	2.08b	3670b
Mulching types								
White polythene	42.65a	9.45a	3.47a	54.67a	33.42a	2.45a	3.44a	4567a
Black polythene	36.68b	9.14a	3.09a	53.45a	28.57b	2.01a	3.37a	4346a
Water hyacinth	32.57c	8.50a	2.78b	51.18a	24.78c	1.99a	2.28b	3158b
Control	30.25c	5.78b	1.67b	49.88b	22.90d	1.08b	2.15b	3076b

Means with the same letter (s) in a column are not significantly different at 5% level of significant (DMRT).

Table 2: Growth and Yield of Onion as influenced by Planting Dates and Mulching Types at Zaria in 2011

Treatments Planting dates	Plant height (cm)	Number of leaves per plant	Number of tillers per plant	Days to 50 % flowering	Number of flowers per plant	Number of bulbs per plant	Bulb yield per plot (kg)	Bulb yield per ha(kg)
15th October	41.22a	11.14a	4.17a	53.33a	24.11a	2.25a	4.22a	4645a
30th October	36.26b	8.67b	4.14a	55.17a	23.41a	1.99a	4.15a	4487a
14th November	33.64c	7.53bc	3.58a	53.85a	23.16a	1.87a	3.38b	3891b
29th November	31.72d	5.48c	3.37a	54.28a	23.12a	1.38b	3.28b	3670b
Mulching types								
White polythene	40.42a	4.47a	3.47a	54.63a	28.42a	2.45a	4.37a	4564a
Black polythene	37.27b	4.34a	3.29a	53.29a	26.57a	2.02a	4.28a	4446a
Water hyacinth	34.33c	4.24a	2.68b	52.24b	24.78b	1.98a	3.86b	3258b
Control	31.55d	3.38b	1.65b	51.04b	21.20c	1.70b	3.67b	3176b

Means with the same letter (s) in a column are not significantly different at 5% level of significant (DMRT).

Effect of mulching types on growth and yield characters of onion in 2011

Table 2 shows that there was a significant difference among treatment means due to mulching types on plant height. White polythene significantly produced a higher treatment mean of (40.42 cm), while the control treatment significantly produced a lower treatment mean of (31.55 cm). There was no significant difference between White polythene, Black polythene and Water hyacinth on number of leaves per plant, but there was a significant difference between these treatments and the control treatment. The control significantly produced a lower treatment mean of (3.38) on number of leaves per plant. There was no significant difference between White polythene and Black polythene on number of tillers per plant, but there was a significant difference with the rest of the treatments. The control treatment significantly produced a lower treatment mean of (1.65) among treatments on number of tillers per plant. Table 2 shows that there was no significant difference between White polythene and Black polythene on days to 50 % flowering was however a significant difference between these treatments and the rest treatments. The control significantly produced a lower treatment mean of (51.04) among other treatments during the period under observation on days to 50 % flowering. White polythene and Black polythene did not produce any significant difference on number of flowers per plant. Significant difference was observed between these treatments and the rest treatments on number of flowers per plant. The control significantly produced a lower treatment mean of (22.90). Table 2 shows that there was no significant difference between White polythene, Black polythene and Water hyacinth on number of bulbs per plant, however significant difference was observed between these treatments and the rest of the treatments. The control significantly produced a lower treatment mean of (1.70) on number of bulbs per plant. Bulb yield per plot and bulb yield per hectare did not show any significant difference among White and Black polythene sheets. However, significant variations were observed between these treatments and the rest of the treatments on both bulb yields per plot and per hectare. The control significantly produced lower treatment means of (3.67 and 3176 kg), respectively. As observed from the results of the trial, White polythene enhanced the production of higher treatment means over other mulches. This observation may mean that White polythene as mulch conserved moisture and is transparent in allowing light penetration through it which enhanced the photosynthetic activities of plants under this treatment resulting into the production of higher treatment means than the other mulches. In the control treatment, there was no moisture conserved which the plants under this treatment were denied access to adequate moisture for normal growth and developmental processes, thus resulting into the production of lower treatment means as reported by (Baten *et al*., 1995; Duranti & Cuocolo, 1989).

CONCLUSION

The results of this experiment showed that planting dates vary in their influence on growth and yield characters of onion. Among the planting dates studied, 15th October was observed to be more suitable than the other planting dates. Mulching types also varied in their effectiveness on influencing growth and yield characters of onion. Among the mulches studied, White polythene mulch gave higher growth and yield of onion. However, further research is needed in different locations before recommending these practices for use by farmers in Nigeria.

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