IJAAR 1 (2013) 22-26

International Journal of Advance Agricultural Research
www.bluepenjournals.org/ijaar

Growth and yield of onion as influenced by planting dates and mulching types in Samaru, Zaria

Hamma I. L.

Samaru College of Agriculture/DAC/ABU, P. M. B. 1058 Samaru, Zaria, Nigeria. E-mail: hammaidi@yahoo.com. Tel: +2348135571447, +234705571437.

Article History
Received 30 January, 2013
Received in revised form 25 March, 2013
Accepted 1 April, 2013

Key words:
Onion,
Planting date,
Mulching type,
Treatment.

Full Length Research Article

ABSTRACT

Two trials were conducted in 2010 and 2011 cropping seasons at the Teaching and Research Farm of the Institute for Agricultural Research, Ahmadu Bello University, Zaria, with co-ordinates: 11°11 N' and 7°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 and was 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, black polythene, water hyacinth and control in sub-plots. Bulbs of onion variety 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 50 kg ha^{-1} were applied to grow the crop in three splits. The first dose was applied a week before transplanting during land preparation, while the second and third doses were applied four and seven weeks after transplanting, respectively. 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. Means were separated using Duncan's multiple range tests (1955). 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. No interactions between planting dates and mulching types were studied.

INTRODUCTION

Onion (*Allium cepa* L.) is one of the major crops among vegetables and is of global importance (Hossain and Islam, 1994). It is use in the preparation of curry and pickle. It is an indispensable diet use both by the rich and poor people of Nigeria, as a condiment but domestic production of onion is very low (Hossain and Islam, 1994). The yields usually vary from 1000–1500 kgha^{-1} when 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 (Ali et al., 2007). 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).

MATERIALS AND METHODS

Two trials were conducted in 2010 and 2011 cropping

seasons at the Teaching and Research Farm of the Institute for Agricultural Research, Ahmadu Bello University, Zaria, with coordinates: 11°11' N and 7°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 and was 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, black polythene, water hyacinth and control in sub-plots. Bulbs of onion variety 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 in three splits; the first dose was applied a week before transplanting during land preparation to serve as a starter dose for the crop, while the second and third doses were applied four and seven weeks after transplanting, respectively. Little water was given to the crop prior to laying down the mulches in the plots immediately after transplanting and 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, and bulb yield. Data collected were analysed statistically. Means were separated using Duncan's multiple range tests (1955).

RESULTS AND DISCUSSION

Effect of planting dates on growth and yield 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 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 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 (3.47). On days to 50% flowering, there was no significant difference between 15th October, 30th October and 14th November. Conversely, 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. October 15th planting date significantly produced higher mean (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 mean from 15th October down to 29th November planting dates. There was no significant difference on means between 15th October, 30th October and 14th November planting dates on number of bulbs per plant. On the other hand, there was a significant difference between these treatments and 29th November planting date on means. 29th November planting date significantly produced a lower mean (1.09). There was equally no significant difference produced between 15th October and 30th October planting dates of means on bulb yield per plot. However, significant difference was observed between these treatments and the rest at P=0.05. The lowest mean was produced by 29th November planting date (2.08). Also, on bulb yield per hectare, 15th October and 30th October planting dates were not significantly different on means. There was a significant difference between these treatments and the rest of the two treatments on bulb yield per hectare. November 29th planting date significantly produced a lower mean (3,670 kg) over other treatments in 2010 cropping season. It was evident that plants sown in 15th October exhibited superior performance both in growth and yield characters. This was due to the fact that there was enough time for plants in this treatment to complete both their growth and developmental stages which enhanced the production and partitioning of photo assimilates, thus leading to an increase in growth and yield characters over the rest of the treatments. Plants sown on 29th November had no adequate time to complete their life cycle because the season was almost winding off as there was not enough rainfall to guarantee their survival 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 means of characters in this treatment as earlier observed by (Oparanadi and Lal, 1987). No interactions between planting dates and mulching types were studied.

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

There was a significant difference among means on plant height due to mulches. White polythene significantly produced a higher mean (42.65 cm) over other treatments. The lowest mean was produced by the control (30.25 cm). There was no significant difference observed among 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 mean (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

Table 1. Growth and yield of onion as influenced by planting dates and mulching types at Zaria in 2010.

Planting date	Treatment							
	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 type								
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).

treatments on number of tillers per plant. The control treatment significantly produced a lower mean (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 existed when compared with the control. The control treatment significantly gave a lower mean (49.88 days) among the treatments. There was significant difference among the treatments on number of tillers per plant. Black polythene significantly gave a higher mean (33.42), while the control gave a lower mean (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 mean (1.08) over 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 means (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 in the production of higher treatment means than the rest of the treatments.

In the control treatment, there was no moisture conservation in which the plants under this treatment were denied adequate moisture for normal growth and developmental processes due to excessive evaporation thus resulting in the production of lower treatment means as earlier reported by (Baten et al., 1995; Duranti and Cuocolo, 1989). No interactions between planting dates and mulching types were studied.

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 mean (41.22 cm and 11.14). On the other hand, 29th November planting date significantly produced lower mean (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 also no significant difference 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 mean (1.38) among the treatments on number of bulbs per plant. Bulb yield per plant and bulb yield per hectare did not show any

Table 2. Growth and yield of onion as influenced by planting dates and mulching types at Zaria in 2011.

Planting date	Treatment							
	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 type								
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).

significant variation in 15th October and 30th October planting dates, respectively. However, significant differences existed between these treatments and the rest of the treatments. November 29th planting date significantly produced lower means (3.28 and 3,670 kg) among treatments on bulb yield per plant and bulb yield per hectare, respectively. It was evident that plants sown 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 leading to 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 not 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 means treatments of characters as observed by (Oparanadi and Lal, 1987). No interactions between planting dates and mulching types were studied.

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

Table 2 shows that there was a significant difference among mulching types on plant height. White polythene significantly produced a higher mean (40.42), while the control treatment significantly produced a lower mean (31.55). 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 mean (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 mean (1.65) among treatments on number of tillers per plant. Table 2 also shows that there was no significant difference between white polythene and black polythene on days to 50% flowering; however there was a significant difference between these treatments and the rest treatments. The control significantly produced a lower mean (51.04 days) 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 mean (22.90). From Table 2, it was observed 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 mean (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 means (3.67 and 3,176 kg). 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, thus resulting into the production of lower treatment means as reported by (Baten et al., 1995; Duranti and Cuocolo, 1989). No interactions between planting dates and mulching types were studied.

Conclusion

The result of this study shows that planting dates and mulching types vary in their influence on growth and yield characters of onion. Among the planting dates studied, 15th October was observed to be the most suitable than the other planting dates. Among the mulches studied, white polythene mulch gave higher growth and yield of onion. However, further research is needed at different locations before recommending these practices for use by farmers in Nigeria.

REFERENCES

Ali M. K., Alam M. F., Alam M. N., Islam M. S. & Khandaker S. M. A. T. (2007). Effect of Nitrogen and Potassium level on yield and quality of seed production of onion. J. Appl. Sci. Res. 3:1889-1899.

Baten M. A., Nahar B. S., Sarker S. C. & Khan M. A. H. (1995). Effect of different mulches on the growth and yield of late planted garlic (*Allium sativum* L.). Pak. J. Sci. Ind. Res. 38:138-141.

Duncan D. B. (1955). Multiple Range and *F*-Test. Biometrics 1-42.

Duranti A. & Cuocolo L. (1989). Chemical weed control and mulching in onion and garlic. Adv. Hort. Sci. 37:338-342.

Hossain A. K. M. A. & Islam M. J. (1994). Status of onion production in Bangladesh. Acta Horticulture. 358:33-36.

Kashi A., Hosseinzadeh S., Babalar M. & Lessani H. (2004). Effect of black polythene mulch and calcium nitrate application on growth and yield of water melon (*Citrullus lanatus*). J. Sci. Tech. Agric. Nat. Resour. 7:1-10.

Oparanadi O. A. & Lal R. (1987). Influence of methods of mulch application on growth and yield of tropical root crops in South Eastern Nigeria. Soil Tillage Res. 1:217–230.

Rhu A. K., Mushi A. A. A. & Khan M. A. H. (1990). Effect of different mulches on the growth of Irish potato (*Solanum tuberosum* L.). Bangladesh J. Bot.19:41–46.

Shaikh A. M., Vyakaranahal B. S., Shekhargouda M. & Dharmatti P. R. (2002). Influence of bulb size and growth regulators on growth, seed yield and quality of onion cv Nasik Red. Seed Res. 30:223-229.