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SUSTAINABLE GROWTH OF ONION THROUGH MULCHING TECHNOLOGY

Jamil Ahmed Jokhio and Tanveer Fatima Miano*
Department of Horticulture, Sindh Agriculture University Tando Jam, Pakistan
*Email: tanveerjamil_hort@yahoo.com

Abstract

The present experiment was conducted to evaluate the safety of environment through mulching technology applied on the sustainable growth of onion (*Allium cepa* L.). The treatments included black plastic mulch, clear plastic mulch and bared soil. Both mulches provided better micro climatic conditions for onion growth and suppressed weeds' growth drastically. However, lowest soil temperature (16.7±1°C), lowest soil moisture (23.26%), lowest number of weeds (14.0) were observed under black plastic mulch followed by clear plastic mulch and bared soil. Mulched onions were taller (55.75 cm) with more number of leaves (13.0) and single bulb weight (126.67 g) which ultimately increased yield per bed (12.503 kg) and yield (20.80 tonnes ha^{-1}) than the bared soil.

Key words: Black plastic mulch, clear plastic mulch, onion

INTRODUCTION

Onion, (*Allium cepa* L) belongs to family amaryllidaceous which is a shallow rooted vegetable crop (Coleman, 1995) is mainly grown for its pungent flavored bulbs and it used world wide to many season foods. The demand for onion is world wide and its use is not limited to any climate or associated with any nationality. Quality and yield losses of about 79-80% due to weed infestation have been reported (Coleman, 1995). Investigations have been done to find an alternative cultural weed control that is ecological friendly devoid of resistance by weeds and yet compatible with the meager resources of farmers will yield handsome dividends in this direction (Karaye and Yakubu, 2006). Mulching was observed to consistently suppress weed growth, particularly during first few weeks after transplanting, onion yields in mulched plots were three times higher than those in unmulched plots. In Onion crops broad leaved species were dominant, followed by grasses and sedges, an increasing shift of some dry land species in to the irrigated low land areas is apparent, owing to both scarce rainfall and inadequate irrigation water. Black polyethylene mulching enhanced the crop growth rate and relative growth rate due to effective weed control and better nutrient utilization (Sarvanane and Kandasamy, 2002). The addition of organic mulches may be a practice feasible for reducing chemical inputs for weed suppression (Baugh et al., 2004). Mulching which offers a practical and reliable means of conserving soil water and regulating soil temperature is likely to have advantageous effects on the growth and

yield of this crop which may reduce cost of irrigation and ensure efficient management of little water resources (Karaye and Yakubu, 2006).

Therefore, the present experiment has been conducted to evaluate the safety of environment through sustainable growth of onion through mulching technology.

MATERIALS AND METHOD

The present investigations were conducted to evaluate the efficacy of different mulches on growth and yield of onion at Sindh Agriculture University, Tandojam during 2005-2006. The Experiment was laid out in a thrice replicated Randomized Complete Block Designs having net sub plot size of 6 m^2 (3 × 2 m). Treatments consisted of T_1) black plastic mulch, T_2) clear plastic mulch and T_3) bare soil. Each plastic mulch was about 32 µm thickened.

Onion seedlings of variety "Phulkara" were raised on October 15, 2005 and transplanted on well prepared ridges on 25th November 2005 at the distance of 15 × 30 cm in standing water on both sides of the ridges. Plastic mulches were laid down on the ridges and holes for transplanting were made at the required distance (15 cm apart) for seedlings. Phosphorus in the form of SSP was applied at the time of ridge preparation. All the cultural operations like hoeing, weeding, irrigation and spraying against insect pests and diseases were carried out time by time.

Following parameters were recorded on the basis of randomly selected 15 plants in each treatment ; soil moisture , soil temperature , plant height (cm), number of weeds $plot^{-1}$, weight of single bulb (g), number of leaves per plant, yield per bed (kg) and yield (tonnes ha^{-1}) .

Mean weekly soil temperature at 12 cm depth through a meter stemmed thermometer was recorded at 13.0 h with three repeated soil temperature measurements and thereof average in each treatment at 5th and 8th weeks after transplanting. For soil moisture observation, soil cores were collected from each treatment at 0 to 8 inches of depth at 5th, 8th and 10th weeks after transplanting (WAT), the moisture percentage was determined by weighting duplicate samples before and after oven drying for >_ 48 hours at 100^{o}C and thereof average was calculated. Mean weight of single bulb (g) was recorded by selecting bulbs at random and weighted on weighing balance machine and then average was calculated. Plant height (cm) and number of leaves were observed at 8, 10 and 12 weeks after transplanting. For counting number of weeds weekly observations were recorded and thereof average was calculated. Onion bulbs when fully matured, were manually harvested from each bed, collected under shade and dried then weighed and finally average was calculated for yield bed^{-1} (kg). Yield was calculated on the basis of yield per bed. Finally data was compiled and subjected to statistical analysis as suggested by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Soil temperature

The results regarding soil temperature show significant difference among treatments, soil temperature beneath black plastic mulch was lower (16.70°C) than clear plastic mulch (19.3°C) as black plastic restricted the direct flow of sunshine on the soil due to which it conserved more soil moisture which lowered the soil temperature a clear plastic mulch and bare soil, However higher soil temperature (22.7°C) was observed beneath bare soil (Table 1). Similar results were observed by Karaye and Yakubu (2006) and Baugh et al. (2004).

Soil moisture (%)

The analyzed data regarding soil moisture content were highly significant among the treatments. Higher soil moisture content (23.26%) were observed under black plastic mulch as it restricted flow of sunshine, provided cooler environment due to which helped in conserving more soil moisture followed by clear plastic mulch (18.73%) whereas lowest soil moisture (15.3%) was observed beneath bare soil. These results are in agreements with the results of Singh (2003) and Karaye and Yakubu (2006) who also found significant difference among treatments.

Weed control

The data regarding mean values for weed control showed that both mulches suppressed weds effectively, however, black plastic mulches suppressed more number of weeds (14.0) than clear plastic mulch (114.67).As black plastic mulch provided un suitable soil environmental conditions for the growth of weeds by blocking sun light which was essential for their germination. Bare soil had more number of weeds (218.3) as it was opened to the sunshine and provided space for weed emergence.

Plant height (cm)

The data regarding mean values for plant height are presented in Table 1, which showed the taller plant (55.75 cm) under black plastic mulch, followed by clear plastic mulch (39.38 cm). Black plastic mulch provided better moisture and nutrient to plants by suppressing the growth of weeds due to which plants became taller. However, smaller plants (38.9 cm) were observed under bare soil as there were many weeds and low quantity of moisture and nutrients were available to plants due to which they became smaller and weak. These results are in accordance with the results of Karaye and Yakubu (2006).

Single bulb weight (g)

The results pertaining to single bulb weight (g) are presented in Table 1. The highest mean bulb weight (128.67 g) was observed in plants under black plastic mulch treatment followed by clear plastic mulch (92.5 g). Plants under bare soil produced lowest bulb weight (74.53 g). Single bulb weight increased due to more conservation of soil moisture, lowered temperature, more suppression of weeds and better utilization of nutrients up take by plants provided by mulches. Similar results were observed by Singh (2003) and Baugh et al. (2004).

Number of leaves plant^{-1}

The results regarding number of leaves per plant are shown in Table 1. The more number of leaves per plant (13.0) were noted under black plastic mulch followed by clear plastic mulch (10.70) and less number of leaves per plant (8.4) was observed in bare soil plants, as there were more weeds and less nutrients were available to plants due to which plants produced less number of leaves. However, black plastic mulch provided better micro environment and better utilization of moisture and nutrients uptake due to which plants produced more number of leaves. These results are in agreement with the results of Schonbeck (1998), Singh (2003) and Karaye and Yakubu (2006).

Table 1: Effect of mulches on various parameters of Onion

Parameters	Treatments			F value	Remarks	LSD @ 5%
	Black plastic	Clear plastic	Bare soil			
Soil moisture (%)	23.26 a	18.73 b	15.36 c	116.57	**	1.4417
Soil temperature (°C)	16.70 c	19.30 b	22.70 a	307.47	**	0.6738
Plant height (cm)	55.750 a	39.38 b	30.95 c	264.13	**	3.0459
Number of leaves plant^{-1}	13.0 a	10.70 b	8.40 c	144.27	**	0.7519
Single bulb weight (g)	126.67 a	92.53 b	74.53 c	4239.95	**	1.5967
Number of weeds	14.00 c	114.67 b	218.33 a	412.96	**	19.741
Yield per bed (kg)	12.50 a	9.81 b	8.65 c	80.83	**	0.8648
Yield (tonnes ha^{-1})	20.80 a	16.35 b	14.41 c	636.93	**	0.509

Yield per bed (kg)

Results pertaining to yield per bed are significantly different from each other. The highest yield per bed (12.50 kg) was recorded for black plastic mulch followed by clear plastic mulch (9.81 kg). However, the lowest yield per bed (8.65 kg) was observed under bare soil. These results

are in agreement with the results of Baugh et al. (2004), Singh (2003) and Karaye and Yakubu (2006).

Yield (tonnes ha^{-1})

The results pertaining to yield per hectare were recorded on the basis of yield per bed (kg) (Table 1). Significant results were observed among all the treatments. As it is clear from the results that black plastic mulched plants produced highest yield (20.80 tonnes ha^{-1}) than clear plastic mulch (16.34 tonnes ha^{-1}). However that lowest yield (14.41 tonnes ha^{-1}) was recorded under bare soil conditions. These results are in accordance with the result of Sarvanane and Kandasamy (2002), Baugh et al. (2004), Singh (2003) and Karaye and Yakubu (2006).

CONCLUSION

It can be concluded from the above results that black plastic and clear plastic mulch provided better environment by conserving sufficient soil moisture, reducing soil temperature, suppressing the growth of weeds due to which plants utilized more nutrients and became taller and healthier. Mulching created no environmental pollution as other weedicides do. These are low cost and can be used repeatedly. Mulching is an attractive Soil management practice in vegetable production.

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