

Effect of polythene mulches on weed management in onion

M. PRAMANICK, D. PAL, A. ROY, S. DEBNATH AND A. DWARY

Department of Agronomy, Bidhan Chandra Krishi Viswavidyalaya
Mohonpur-741252, Nadia, West Bengal

ABSTRACT

A field trial was undertaken at Regional Research Station (Hill Zone), Kalimpong, Darjeeling during the year 2002 and 2003 with five different coloured polythene mulches on onion crop with the objective to observe the effect of different coloured polythene mulches on weed management as well as bulb yield. The result depicted significant reduction in weed population and biomass in blue coloured polythene mulch followed by black coloured mulch. Highest bulb yield was found in off-white coloured polythene mulch followed by blue and black coloured mulch and their increase in yield as compared to control were 54.21%, 34.53% and 29.46% respectively. The highest mean net production value (rupees per rupee investment) was recorded in blue coloured polythene mulch (6.92) followed by black polythene mulch (6.80).

Key words : Polythene mulch, weed management, onion.

Polythene mulches have been practiced for soil solarisation during winter months in various vegetable crops in order to control different soil based diseases, insects and weeds. Soil solarisation with polythene film (transparent) conserved more soil moisture and more than doubled the concentrations of NH_4^+ -N and NO_3^- - N compared with other synthetic mulches (Adetunji, 1994). Application of black polythene mulch did not require any other weed control measure and produced higher yield in capsicum and cabbage in USA (Russo *et al.*, 1997). Transparent polythene film increased soil temperature, mean soil water content and bulb yield of onion but reduced weed population in onion (Suh and Kim, 1991). Hence, use of different coloured polythene mulches in weed management of onion crop as a non-chemical approach was undertaken in the present investigation.

MATERIALS AND METHODS

The experiment on weed management in onion crop was conducted at Regional Research Station (Hill Zone), Kalimpong, Darjeeling during the year 2002 and 2003 in randomized block design with four replications. The treatments included five different coloured polythene mulches viz. off-white, black, pink, blue and white, along with no mulch treatment (Table 1). Seedling of 'Nasik Red' variety were planted at 30 cm × 15 cm spacing and the crop was fertilized with Farm yard manure @ 15 t/ha and N : P_2O_5 : K_2O @ 120 : 40 : 60 kg/ha. After stand establishment of onion seedlings, different coloured

polythene strips were kept in between row spaces as mulch material upto ten days before harvesting. The crop was transplanted during first week of February and harvested during early part of June. Observation on quantification of weeds, average bulb weight, bulb yield and net production value as rupees per rupee investment were taken.

RESULTS AND DISCUSSION

Weed population, weed biomass and Weed Control Efficiency (WCE)

Significantly lower number (mean of two years) of weeds (broad leaved and grasses) were observed in blue coloured polythene mulch followed by black coloured polythene mulch (Table 1). The mean number of broad leaved weeds (viz., *Amaranthus spinosus*, *Tridax procumbens*, *Eclipta alba*) under blue, black and no mulch treatment were 47, 44 and 59.66 respectively whereas that of grass weeds (*Cynodon dactylon*, *Brachiaria ramosa*) under blue, pink, black and no mulch treatments were 6.66, 11.00, 11.66 and 20.33 respectively (Table 1). Soil solarization with transparent polythene film reduced the number of weed species from 7 to 4 in onion (Silveira *et al.*, 1990). Similar result was also found by Singh (1992).

Like number of weeds, weed biomass was also influenced significantly with different coloured polythene mulches where blue coloured recorded lowest mean weed biomass followed by black coloured polythene with no significant different

between the two (Table 1). Seed bed solarization with 50 μ m thick transparent polythene mulch for six weeks gave the lowest number and weight of weeds per m^2 as compared to untreated plot and the

magnitude of reduction were 100%, 80% and 16% for annual broad leaved, annual grasses and perennial weeds respectively (Abdallah, 1998).

Table 1 Effect of different coloured polythene mulches on weed in onion

Treatments	Weed number/ m^2						Weed biomass (g/m^2)			Weed control efficiency (WCE) (%)		
	Broad leaved			Grasses			2002	2003	Mean	2002	2003	Mean
	2002	2003	Mean	2002	2003	Mean						
T ₁	56.12	63.20	59.66	19.00	21.66	20.33	535.00	1363.33	949.16	-	-	-
T ₂	48.56	48.1	48.33	17.00	17.66	17.33	331.25	913.33	622.29	38.08	33.00	35.54
T ₃	43.00	45.00	44.00	11.32	12.00	11.66	243.75	690.00	466.87	54.43	49.38	51.90
T ₄	54.00	60.00	57.00	10.00	12.00	11.00	356.23	693.33	524.78	33.41	49.14	41.27
T ₅	44.00	50.00	47.00	6.32	7.0	6.66	157.5	593.33	375.41	70.56	72.46	70.51
T ₆	53.66	55.00	54.33	17.00	21.66	19.33	409.17	624.66	516.58	23.51	62.10	42.8
SEm (\pm)	3.77	6.17	0.89	1.28	8.09	0.45	58.03	116.77	57.08	23.51		
CD 0.05	NS	NS	2.80	4.03	NS	1.42	182.81	367.87	179.82			

T₁ – No mulch control, T₂ – polythene mulch (of-white), T₃ – polythene mulch (black), T₄ – polythene mulch (pink), T₅ – polythene mulch (blue), T₆ – polythene mulch (white).

Similarly, weed control efficiency (WCE) was found higher in blue coloured polythene mulch followed by black coloured one (Table 1). However, in Nigeria, black polythene mulch was found efficient one among the other mulch treatments in terms of weed control in onion (Chhangani 2000).

Bulb yield, average bulb weight and Net Production value

Bulb yield (mean of two years) of onion was affected significantly with different coloured

polythene mulches where off-white coloured polythene mulch recorded highest bulb yield followed by blue and black coloured but there was no significant difference among themselves (Table 2).

Like bulb yield, average bulb weight also influenced significantly with different coloured polythene mulches (Table 2). Highest average bulb weight (mean of two years) was found in off-white coloured followed by blue and black coloured polythene mulches.

Table 2 Effect of different coloured polythene mulches on productivity of onion

Treatments	Average bulb weight (g)/plant (fresh weight basis)			Bulb yield (q/ha)			Net production value (Rupees/rupee investment)		
	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean
T ₁	39.69	87.34	63.51	87.33	192.16	139.74	3.53	6.77	5.15
T ₂	69.85	104.24	87.04	153.67	229.33	191.5	5.38	8.0	6.69
T ₃	58.33	106.13	82.23	128.33	233.5	180.91	4.96	8.64	6.80
T ₄	60.15	98.33	79.24	132.33	316.33	174.33	4.31	7.25	5.78
T ₅	59.39	111.51	85.45	130.67	245.33	188.00	4.91	8.93	6.92
T ₆	51.81	104.46	78.13	114	229.83	171.91	3.48	7.54	5.51
SEm (\pm)	4.19	12.34	2.55	9.21	27.15	5.61			
CD 0.05	13.20	NS	8.03	29.01	NS	17.67			

T₁ – No mulch control, T₂ – polythene mulch (of-white), T₃ – polythene mulch (black), T₄ – polythene mulch (pink), T₅ – polythene mulch (blue), T₆ – polythene mulch (white).

Similarly, highest net production value (NPV) (Rupees per Rupee investment) was recorded in blue coloured polythene mulch followed by black coloured polythene mulch (Table 2). In a semi-tropical environment of USA, white or black plastic mulch provided the greatest yield enhancement from increased weight and bulb size of onion showed an increase in grower's net return of more than Rs. 13,320 /ha (US \$ 296 /ha) (Vavrina and Roka, 2000).

Hence, use of blue coloured polythene mulch in onion showed an efficient non-chemical physical weed control method.

REFERENCES

- Abdallah, M.M.F. 1998. Improving vegetable transplants using soil solarization II. Onion "*Allium cepa*". *Annals of Agricultural Sciences -Cairo*. 3 : 831-843.
- Adetunji, I. A. 1994. Response of onion to soil solarization and organic mulching in semi-arid tropics. *Scientia Horticulturae*. 60(1-2) : 161-166.
- Chhangani, S. 2000. Effects of mulches (synthetic and non-synthetic) on water conservation and bulb yield of irrigated onion cultivated in semi-arid zone of Borno State, Nigeria. *Journal of Eco-Physiology*. 3(1-2) : 5-9.
- Russo, V. M.; Cartwright, B. and Webber, C. L. 1997. Mulching effects on erosion of soil beds and on yield of autumn and spring planted vegetables. *Biological Agriculture and Horticulture*. 14(2) : 85-93.
- Silveria, H. L.; Gomes, R.; Aguiar, L.; Caixinhas, M. L.; Bica, J. and Bica, M. 1990. Soil solarization under polythene film : cultivation of lettuce and onions. *Plasticulture*. 85 : 35-42.
- Singh, S. P. 1992. Studies on mulching of vegetable crops – a review. *Advances in Horticulture and Forestry*. 2 : 115-143.
- Suh, J. K. and Kim, Y. B. 1991. Study of improvement of mulching culture method in onion. 1. Influence of much materials and times on growth and yield. Research Reports of the Rural Development Administration, Horticulture. 33 : 31-36.
- Vavrina, C. S. and Roka, F. M. 2000. Comparison of plastic mulch and bare-ground production and economics for short day onions in a semi-tropical environment. *Hort Technology*. 10(2) : 326-330.