

Short Communication

Weed management in cabbage (*Brassica oleracea* var. *capitata* L.)

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Abstract

A field experiment was conducted during 2017-18 at Centre for Hi-tech Horticulture and Precision Farming, Vellanikkara, Thrissur to assess the efficacy of different weed management technologies involving both chemical and non-chemical methods in cabbage. The experiment was laid out in randomized block design with eight treatments and three replications. Among the different treatments, mulching with silver-black polythene alone maintained a weed free condition and resulted in superior yield characters such as head length, head breadth and gross and net head weight. Yield of 16.83 t/ha could be realized under polythene mulching. Pre emergence application of pendimethalin 1.5 kg ha⁻¹ plus manual weeding at 30 DAP gave the next best result in terms of yield and weed control efficiency. Stale seed bed followed by glyphosate application plus manual weeding at 30 DAP, hand weeding twice at 25 and 50 DAP and pre emergence application of oxyfluorfen 0.2 kg ha⁻¹ plus manual weeding at 30 DAP gave comparable per hectare yields of 8.53, 7.90 and 7.44 tonnes respectively. High density planting plus manual weeding at 30 DAP and coconut frond mulching gave lower yields as a result of lower weed control efficiency.

Keywords: Cabbage, Coconut frond mulch, Oxyfluorfen, Pendimethalin, Polythene mulch, Stale seed bed, Weed management.

Cabbage is an important cool season annual vegetable crop belonging to the family Brassicaceae. In Kerala its cultivation was restricted to the hill tracts of Idukki and Wayanad districts till recently. With the introduction of tropical varieties and hybrids by the Kerala Agricultural University, cultivation of the crop has spread to the plains also (Narayanankutty et al., 2012). The heavy manurial and frequent irrigation requirements of this crop create conducive conditions for germination and growth of weeds, which reduce cabbage yield by 45-80 per cent (Chadha, 2001). Taking these factors into consideration, the present experiment was conducted to assess the efficacy of different weed management technologies involving both chemical and non-chemical methods on weed control efficiency and yield of cabbage.

The field experiment was carried out at Centre for Hi-tech Horticulture and Precision Farming, Vellanikkara, Thrissur during November 2017 to March 2018. The experiment was laid out in RBD with 8 treatments replicated thrice. The treatments were oxyfluorfen (0.20 kg ha⁻¹) (PE-Pre emergence) plus one hand weeding at 30 DAP, pendimethalin (1.50 kg ha⁻¹) (PE) plus one hand weeding at 30 DAP, high density planting (0.6m x 0.3m) plus one hand weeding at 25 DAP, mulching with coconut fronds, mulching with silver-black polythene (30 microns), stale seed bed followed by glyphosate application plus one hand weeding at 30 DAP, hand weeding at 25 and 50 DAP and an unweeded control. Net plot size was 6m x 2.4m. Twenty eight days old seedlings of cabbage variety NS 183 were transplanted at a spacing of 60cm x 60cm. Manures and fertilizers were applied according to the

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package of practices recommendations of Kerala Agricultural University (KAU, 2016). Weed management was done as per treatment specifications. In the plots receiving treatment with pre emergence herbicides, pendimethalin (Stomp® 30 EC) at 1.5 kg ha⁻¹ and oxyfluorfen (Goal® 23.5 EC) at 0.2 kg ha⁻¹ were sprayed before planting. Silver-black polythene sheet of 30 micron gauge was used for the mulching treatment. In stale seed bed treatment, beds were prepared 2 weeks prior to planting and the emerged weeds were killed before planting by spraying glyphosate. Planting was done on the same day in all the treatments. From each plot, five plants were selected randomly as the sampling unit for biometric observations. Cabbage head length, head breadth, head index and days to 50 per cent head maturity were recorded.

Mature head was cut vertically and the head length and breadth were measured. Head index was calculated as the ratio of head length to head breadth. Days to 50 per cent head maturity were recorded as the number of days from transplanting to producing marketable heads by 50 per cent plants.

The weed count and weed dry matter production in each treatment were recorded at 25 and 50 days after planting and the data are presented in Table 1. Major weeds found in the experimental field were broad leaf weeds which comprised of *Trianthema portulacastrum*, *Oldenlandia* sp., *Cleome viscosa*, *Cleome burmanii*, *Borreria hispida* etc., among which *Oldenlandia* sp. was highest in number. *Eleusine indica* was the dominant grass species followed by *Digitaria* sp. *Cyperus iria* was the only sedge observed in the field. Weed control practices significantly influenced the weed count, weed dry matter production and weed control efficiency. Silver-black polythene was found to be the best treatment for controlling weeds and gave a cent per cent weed control efficiency (Table 1). Among pre emergence herbicides, pendimethalin gave good weed control efficiency of 98 per cent at 50 DAP. Coconut frond mulching reported a lower weed count and dry matter at 25 days after planting. However, at 50 days after planting it could not effectively manage the weeds and produced greater weed dry weight. The weeds which germinated and emerged out through the mulch continued to grow

Table 1. Effect of weed management practices in cabbage on weed count, weed dry weight and weed control efficiency

| Treatments | Weed count (No./m ²) | | Weed dry weight (kg/ha) | | Weed control efficiency (%) | |
|---|----------------------------------|-------------------------------|---------------------------------|---------------------------------|-----------------------------|--------|
| | 25 DAP | 50 DAP | 25 DAP (kg/ha) | 50 DAP (kg/ha) | 25 DAP | 50 DAP |
| T ₁ Oxyfluorfen (0.20 kg/ha) + 1 HW at 30 DAP | *5.08 ^d (26.00) | 4.90 ^d (24.00) | 15.07 ^c (228) | 15.70 ^c (246.67) | 86.04 | 96.06 |
| T ₂ Pendimethalin (1.50 kg/ha) + 1 HW at 30 DAP | 3.56 ^c (12.67) | 5.15 ^d (26.67) | 9.81 ^f (98) | 10.95 ^f (120) | 94.04 | 98.08 |
| T ₃ HDP with spacing of 0.6 m x 0.3m + 1 HW at 25 DAP | 14.33 ^a (205.33) | 9.33 ^a (87.33) | 37.82 ^b (1430.67) | 19.37 ^d (375.33) | 12.49 | 93.00 |
| T ₄ Mulching with coconut fronds (2 layers) | 8.90 ^c (79.33) | 7.07 ^c (50.00) | 26.95 ^c (727.33) | 56.52 ^b (3205.33) | 55.52 | 48.96 |
| #T ₅ Mulching with black and silver polythene | - | - | - | - | 100 | 100 |
| T ₆ Stale seed bed/b glyphosate application + 1 HW at 30 DAP | 8.52 ^c (72.67) | 3.61 ^c (13.33) | 24.53 ^d (602) | 11.62 ^f (135.33) | 63.16 | 97.83 |
| T ₇ Hand weeding (25 and 50 days after planting) | 13.88 ^a (192.67) | 8.08 ^b (65.55) | 37.01 ^b (1370) | 27.99 ^c (784) | 16.26 | 87.43 |
| T ₈ Unweeded control | 12.60 ^b (158.67) | 8.68 ^{ab} (75.33) | 40.45 ^a (1636) | 79.12 ^a (6262.67) | 0 | 0 |
| CD(0.05) | 0.642 | 0.718 | 1.870 | 3.155 | | |

* $\sqrt{x+0.5}$ transformed values, original values in parentheses. In a column, means followed by common letters do not differ significantly at 5% level in DMRT. **DAP- Days after planting # Polythene mulching was not subjected to statistical analysis as no weed count could be realized

Table 2. Effect of weed management practices in cabbage on head size and days to 50 % head maturity

| Treatments | Head length (cm) | Head breadth (cm) | Head index | Days to 50% head maturity |
|--|----------------------|----------------------|--------------------|------------------------------|
| T ₁ : Oxyfluorfen (0.20 kg/ha) + 1 HW at 30 DAP | *10.20 ^{cd} | 9.37 ^{bc} | 1.10 ^c | 71.67 ^c |
| T ₂ : Pendimethalin (1.50 kg/ha) + 1 HW at 30 DAP | 11.72 ^b | 10.60 ^b | 1.11 ^c | 70.00 ^c |
| T ₃ : High density planting with spacing of 0.6 m x 0.3m + 1 HW at 25 DAP | 9.20 ^{dc} | 8.43 ^{cd} | 1.10 ^c | 78.33 ^b |
| T ₄ : Mulching with coconut fronds (2 layers) | 8.60 ^c | 7.23 ^d | 1.23 ^{ab} | 80.00 ^{ab} |
| T ₅ : Mulching with black and silver polythene | 13.95 ^a | 12.57 ^a | 1.12 ^{bc} | 63.00 ^d |
| T ₆ : Stale seed bed/ fb glyphosate application + 1 HW at 30 DAP | 10.53 ^{bc} | 9.70 ^{bc} | 1.09 ^c | 72.33 ^c |
| T ₇ : Hand weeding (25 and 50 days after planting) | 10.46 ^c | 9.40 ^{bc} | 1.12 ^{bc} | 72.67 ^c |
| T ₈ : Unweeded control | 5.83 ^f | 4.73 ^c | 1.26 ^a | 85.00 ^a |
| CD(0.05) | 1.198 | 1.381 | 0.116 | 5.417 |

* In a column, means followed by common letters do not differ significantly at 5% level in DMRT

and by this time, the coconut fronds had started disintegration. High density planting reported a higher weed dry weight (1430 kg/ha), next only to unweeded control at 25 days after planting, but at 50 days after planting the dry matter production was reduced to 375 kg/ha which was less than that in hand weeding (784 kg/ha), though weed density was the highest. Closer planting resulted in crop covering the entire soil surface and shading the germinated weeds, preventing further development. Data on head length, head breadth, head index and days to 50 per cent head maturity are given in Table 2. Highest values for head length (13.95cm) and head breadth (12.57cm) were reported under polythene mulching which was significantly superior to all other treatments. Pendimethalin applied plots gave the next best values. Polythene mulching reported the lowest duration to attain 50% head maturity (63 days) and unweeded control the greatest (85 days). Easmin et al. (2009) found similar results in Chinese cabbage where no-mulch treatment required more number of days to start head formation whereas polythene mulching

registered the lowest number. Pendimethalin, stale seed bed, hand weeding and oxyfluorfen treatments were on par with respect to number of days to 50 per cent head maturity.

Gross and net cabbage yields were recorded and expressed in t/ha (Table 3). Significantly higher gross yield of 38.97 t/ha and net yield of 16.83 t/ha were obtained from polythene mulched plots. The increase in the net yield was 94.59 per cent in polythene mulching as compared to unweeded check. This is in agreement with observations of Salim et al. (2008), who found that plastic mulching increased marketable yield and yield attributes in cauliflower. Similar results were found by Masarirambi et al. (2013) in Savoy baby cabbage. Polythene mulch helps in suppressing weeds and improving soil properties like soil temperature, bulk density, aggregate stability, moisture content and nutrient availability (Lalitha et al., 2010). Pendimethalin treatment resulted in a net yield of 10.26 t/ha. Arora et al. (2006) observed that among different treatments (hoeing, pendimethalin and

Table 3. Gross and net yield of cabbage as influenced by weed management treatments

| Treatments | Gross yield (t/ha) | Net yield(t/ha) |
|--|----------------------|--------------------|
| T ₁ : Oxyfluorfen (0.20 kg/ha) + 1 HW at 30 DAP | *23.022 ^b | 7.44 ^{cd} |
| T ₂ : Pendimethalin (1.50 kg/ha) + 1 HW at 30 DAP | 27.461 ^b | 10.26 ^b |
| T ₃ : High density planting with spacing of 0.6 m x 0.3m + 1 HW at 25 DAP | 15.114 ^c | 5.72 ^d |
| T ₄ : Mulching with coconut fronds (2 layers) | 11.956 ^c | 3.21 ^e |
| T ₅ : Mulching with black and silver polythene | 38.966 ^a | 16.83 ^a |
| T ₆ : Stale seed bed/ fb glyphosate application + 1 HW at 30 DAP | 23.884 ^b | 8.53 ^{bc} |
| T ₇ : Hand weeding (25 and 50 days after planting) | 22.667 ^b | 7.90 ^c |
| T ₈ : Unweeded control | 5.620 ^d | 0.97 ^f |
| CD(0.05) | 5.181 | 1.978 |

* In a column, means followed by common letters do not differ significantly at 5% level in DMRT **DAP- Days after planting

pendimethalin + hoeing), highest cabbage yields were obtained from treatment where pendimethalin (1 kg/ha) and one hoeing was given. The net yields in treatments, stale seed bed, hand weeding and oxyfluorfen application were on par. High density planting and coconut frond mulching gave lower yields. Patel (1995) also reported lower yields in cabbage planted at a closer spacing of 30 cm x 30 cm compared to normal spacing when both were given a hand weeding at 21 DAP. Higher weed growth seen under coconut frond mulching may have influenced crop growth adversely and thereby yield. Unweeded control resulted in a yield loss of 94.59 per cent.

In this experiment, silver-black polythene mulch was found to be the best among the different treatments tried.

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