STUDIES ON SOIL SOLARIZATION FOR WEED CONTROL IN NURSERY BEDS

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DEPARTMENT OF AGRONOMY
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BANGALORE
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STUDIES ON SOIL SOLARIZATION FOR WEED CONTROL IN NURSERY BEDS

SUDHA T.

Thesis submitted to the
University of Agricultural Sciences, Bangalore
in partial fulfilment of the requirements
for the award of the Degree of

Master of Science (AGRICULTURE)

in

AGRONOMY

BANGALORE JANUARY 1997

Affectionately dedicated

to my beloved

Parents, Uncle, Sister and Brothers

DEPARTMENT OF AGRONOMY

UNIVERSITY OF AGRICULTURAL SCIENCES

BANGALORE

CERTIFICATE

This is to certify that the thesis entitled "**STUDIES ON SOIL SOLARIZATION FOR WEED CONTROL IN NURSERY BEDS**" submitted by **Miss. SUDHA, T.** for the degree of **MASTER OF SCIENCE (AGRICULTURE)** in **AGRONOMY** to the University of Agricultural Sciences, Bangalore, is a record of bonafide research work carried out by her during the period of her study in this University under my guidance and supervision and the thesis has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar titles.

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(SUDHA, T.)

BANGALORE

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INTRODUCTION

I. INTRODUCTION

Weeds are that part of the non-crop vegetation which reduce quality and quantity of existing crops. Rampant occurrence of weeds is a focal problem in nursery. Weeds compete with nursery seedlings for water, nutrients, light and space which adversely affect the growth of the seedlings. Some weeds due to their morphological similarity viz., Echinochloa crusgalli (L.) and Echinochloa colonum with rice seedlings during early stages of their growth get transplanted with rice seedlings in the main field. Controlling weeds in the nursery would be rather easy for checking dissemination of weeds in the main field and the time available for weeding appears to be short in nursery.

Manual weeding in nursery is proved to be time consuming, expensive and ineffective. In modern agriculture, chemical weed control using the herbicides is the most popular method as it is labour and energy efficient than the other methods. However, widespread application of herbicides has led to concerns about contamination of environments, residue problems in soil and water, toxicity to animals and appearance of resistant weeds. The time demands that the new method besides being efficient and cost effective needs to be non-hazardous to the user as well as to the environment. In this context, use of soil solarization for weed control is of late gaining importance.

Soil solarization as a method of soil disinfection has been developed in 1976 by Katan and associates in Israel. Various terms are used to describe this method like solar heating, soil solarization, plastic or polyethylene tarping or mulching of soil.

Soil solarization can be defined as a method of heating the surface of soil by plastic sheets placed on moist soil to trap the solar radiation and thereby increase the soil temperature.

Soil solarization process would raise the surface soil temperature by 8-12°C as compared to non-solarized soil. A duration of 4-6 weeks is sufficient to give satisfactory control of weeds. Many annuals, some perennials and parasitic weeds are sensitive to this treatment. Besides, controlling soil borne pests, soil solarization is reported to enhance availability of nutrients in soil and favour beneficial microflora, ultimately resulting in increased plant growth responses in many crop plants.

Soil solarization technique is simple and easy to adopt by farmers. However, its immediate application appears to be more promising in nursery areas and in high value crops, such as in vegetable growing, floriculture etc.

Soil solarization is an integrated method of increasing, growth and yield under the limitations of its

applicability, soil solarization is a safe and effective method of disease, pest and weed control that may reduce the necessity for chemical applications to soil.

As far as its application in India is concerned, almost every area is climatically suitable for soil solarization. Vast majority of the area experiences mean daily maximum temperature of 35-40°C in the months of April-June. It is also the time when the land is fallow enabling farmers to practice this technique without sacrificing his land/crop, with the present policy of popularising plastics in agriculture and with a large quantity of cheaper recycled plastic available in the market, the chance of using it for soil solarization is becoming popular.

Under these circumstances, an experiment entitled "Studies on soil solarization for weed control in nursery beds" was taken up with the following objectives.

1. To study the efficacy of soil solarization as an effective method of weed control in nursery beds.
2. To evaluate the different soil heating materials in relation to weed control.
3. To work out the economics of the use of different methods of solarization.

REVIEW OF LITERATURE

II. REVIEW OF LITERATURE

In this chapter, literature pertaining to effect of soil solarization for weed control in nursery beds conducted during 1996 are presented.

2.1 Effect of soil solarization on soil temperature

Jacobsohn et al. (1980) reported that mulching the soil with polyethylene sheets before sowing during the hot season, increased the soil temperature, which resulted in the control of soil borne pathogens and weeds. Typical maximal soil temperatures in solarized plots were 8-12°C higher than corresponding non-mulched plots (Katan, 1980).

In field experiments in Israel during summer, maximum soil temperature under plastic cover at the 5 cm depth averaged 46-49°C (Horowitz et al., 1983). Even at 15 cm, soil temperature of six soils of four different texture in Davis, USA was raised by 10-12°C due to solarization (Stapleton et al., 1985).

At Aberdeen, USA, soil temperature at 15 cm depth reached 41°C when maximum air temperature ranged between 26-33°C (Davis and Sorenson, 1986). Mc Sorley and Parrado (1986) reported that soil solarization showed significantly higher soil temperature during the summer.

Braun et al. (1987) observed the possibilities and limitations of solarization a physical method for soil sanitation achieving increase in soil temperature to a maximum of 44°C at 5 cm depth by covering moist soil with transparent plastic sheets in South Germany. Temperature in solarized plots reached upto 51°C (Cartia, 1987). In Italy, solarization increased soil temperature at 5 cm from 38-40°C to 45-48°C (Garibaldi, 1987).

Kwon et al. (1988) reported that soil temperature through out the growing season was highest under transparent polyethylene film, lowest under the white PVC and intermediate under black polyethylene. Maximum soil temperature under polyethylene at 5 cm was 55°C in 1985, 48°C in 1986 and 57°C in 1987. Fifty centimeter thick clear polyethylene mulch in June 1985 exceeded non-solarized soils temperature by 12.3°C and 6.6°C at 5 cm and 20 cm depth, respectively after 98 days (Sauerborn et al., 1989).

In Colima, Mexico, the increase in soil temperature due to solarization was 6-13°C (Stapleton, 1991). Increase in soil temperature was maximum under transparent polyethylene 0.05 mm (48.8°C) compared to transparent polyethylene 0.10 mm (45°C) and black polyethylene (39°C) due to its better transmittance of solar radiations (Meti and Hosmani, 1994).

2.1.1 Film type and characteristics

Chen and Katan (1980) reported that mulching with transparent polyethylene (0.03 to 0.05 mm) increased the soil temperature by 10-12°C.

At IARI, New Delhi transparent polyethylene mulching recorded maximum rise in soil temperature (Chopra and Choudhary, 1980).

Chen et al. (1983) found that solarization with transparent polyethylene films increased the temperature of the top soil layers and decreased the soil heat loss. At IARI, New Delhi, Choudhary and Chopra (1983) reported that there was significant increase in soil temperature at 0-15 cm depths of soil due to mulching with transparent polyethylene film.

Horowitz et al. (1983) reported that higher temperatures and better residual weed control was produced by transparent than by black plastic sheets with best results from 0.03 mm transparent polyethylene (40 µm) soil temperature recorded at 5 cm was elevated to 53°C in a clayey soil (Katan et al., 1983). Solar heating of the soil by mulching it with transparent polyethylene during the hot season elevated the soil temperature by 10 to 18°C above that of the non-mulched plots (Rubin and Benjamin, 1983).

Standifer et al. (1984) observed that the extent of rise in maximum soil temperature under black mulch was 6°C lower than that under transparent mulch. Soil temperature at 5, 10 and 15 cm depths were highest in plots mulched with transparent polyethylene than with black polyethylene sheets (Yoon et al., 1984).

Soil temperature was significantly higher under a clear plastic mulch than under black plastic, but black polyethylene increased the soil temperature above that of bare soil (Salman and Gorski, 1985). Maximum soil temperature was recorded in beds covered with transparent polyethylene (44.1°C), followed by black (39.6°C) as against 37.5°C in uncovered plot (Sivakumar and Marimuthu, 1987).

Ragone and Wilson (1988) reported that 4 mm thick clear polyethylene sheets for 6 weeks increased the maximum temperature of soils relative to that in uncovered plots from 35-44°C, 33-35°C and 29-33°C at 5, 15 and 30 cm depth respectively. At Valencia in Spain extremely high temperature of 60°C was achieved at 10 cm by solarization with transparent polyethylene (Del Busto et al., 1989). Solarizing with transparent polyethylene of 50 µm thickness led to an increase in soil temperature maximum by 10°C (Melero et al., 1989). Solarization with thin transparent polyethylene (50 µm), resulted in raising soil temperature to 58°C (Satish Lodha, 1989).

Satish Lodha and Anjalivaidya (1990) reported that solarization in the month of June with transparent polyethylene increased the soil temperature at 5 cm by 9-12°C. Solarization was achieved by covering plots with a clear polyethylene sheet, 0.03 mm thick for 8 weeks (Yucel, 1995). The increase in soil temperature due to transparent polyethylene 0.05 mm, transparent polyethylene 0.1 mm and black polyethylene was 8.7-11°C, 5.1-5.8°C and 2.5-3.2°C respectively over the control (Habeebur Rahman and Hosmani, 1996).

2.1.2 Temperature increase due to soil solarization at various depths

Aloi and Noviello (1982) reported that soil temperature attained through solarization was 44-57°C at 5 cm and 36-45°C at 10 cm. The temperatures in solarized plots at 5 and 10 cm were 45.2 to 47°C and 37.9 to 39.9°C respectively (Kodama and Fukul, 1982).

Egley (1983) observed that maximum temperature at 1.3 cm depth under the polyethylene sheets reached 65 to 69°C for 3 to 4 hours of the mid-afternoon on clear days as compared with 43 to 50°C at 1.3 cm in soils that were not covered. Maximum soil temperature under plastic cover at 5 cm depth averaged 46 to 49°C and solarization effect was restricted to 0-5 cm depth (Horowitz et al., 1983).

Braun et al. (1987) reported that soil temperature at 5 cm depth under the sheet reached 58°C, weed emergence after 30 or more days solarization was reduced by 57-83 per cent. In the vertisols of ICRISAT, Hyderabad, India the mean maximum temperature in solarized plots reached 53.9, 46.6 and 38.3°C at 5, 10 and 15 cm depths as against 43.7, 37.6 and 32.4°C in non-solarized plots (Chauhan et al., 1988).

The temperature reached maximum in upper 10 cm within 4-5 days but it took 5-6 days to attain the maximum in lower depths of 20-45 cm. Soil temperature increase was 8°C near the surface and even at 20 cm there was 7°C increase in soil temperature as reported by Kaewruang et al. (1989), solarization increased soil temperature at 6 cm from 35 to 48°C and at 24 cm from 37 to 45°C (Tamietti and Garibaldi, 1989).

At 15 cm soil depth, maximum increase upto 10 and 6°C was recorded in dry and wet mulched soils, respectively at 1600 hr, however this increase was only 4.5°C (dry) and 5°C (wet) at 30 cm soil depth when compared with their control (Kumar et al., 1993). Tu et al. (1991) reported that mulching with a transparent plastic sheet increased the soil temperature at a depth of 5 cm by 12°C and soil temperature reached 40°C or more for 119 hrs during the 15 days test period.

Mugnozza and Picuno (1992) reported that soil temperatures of more than 40°C were found at a depth of 20 cm under mulching compared to only 5 cm in soil, and that temperatures more than 50°C were registered at 5 cm under polyethylene mulching.

2.1.3 Duration of soil solarization on weed control

Stapleton and Devay (1982) observed that the solarization treatment is most effective when applied during the warmest summer months and the plastic sheet left in place for as long as possible.

Two to four weeks of solarization produced effective control of annual weeds that was still appreciable after one year (Horowitz et al., 1983). Rubin and Benzamin (1983) reported that solar heating for 4 to 5 weeks resulted in effective control of most summer and winter annual weeds, the effect lasting for more than five months after polyethylene removal.

Fifty five days solarization with transparent polyethylene decreased germination of many weed species and the weed cover was reduced by 97 per cent (Hildebrand, 1986).

Abu-Irmaileh (1991) reported that solarization for 6 weeks reduced broom rape infestation and improved the crop yields. Solarization treatments for 1 to 4 weeks

significantly reduced the total weed emergence of prickly sida, pig weeds, morning glory and various grass species from natural weed population for the growing season by 64-98 per cent.

Mulching for 16 days decreased weed emergence but to a lesser extent than the 32 days treatment (Kumar *et al.*, 1993). Habeebur Rahman and Hosmani (1996) reported that solarization for 30 days and 40 days caused maximum reduction in weeds.

2.1.4 Soil solarization on weed control

Grinstein *et al.* (1979) reported that solarization controlled many weeds including *Digitaria sanguinalis*, *Portulaca oleracea*, *Amaranthus retroflexus*, *Xanthium spinosum* and *Cynadon dactylon*.

Jacobsohn *et al.* (1980) reported that mulching the soil with polyethylene sheets before sowing during the hot season, increased the soil temperature, which resulted in the control of soil borne pathogens and weeds.

Katan *et al.* (1980) found that solarization in onion fields of Israel, decreased the weed population except *Melilotus alba*. Many annual and perennial weeds were effectively controlled including the species of the genera *Amaranthus*, *Anagallis*, *Avena*, *Capsella*, *Chenopodium*, *Cynadon*,

Digetaria, Eleusine, Lactuaca, Montia, Mercurialus, Phalaris, Poa, Portulaca, Sysimbrium, Solanum, Stellaria and Xanthium.

Horowitz et al. (1983) reported that the solarization produced effective control of annual weeds that was still appreciable after one year. Many annual weeds, both summer and winter species were controlled. Solarization caused reduction in population of Avena fatua, Chenopodium album and Sorghum halepense by 60-100 per cent as reported by Katan et al. (1983).

Control of Ditylenchus dipsaci, Amaranthus retroflexus, Avena fatua, Chenopodium album, Convolvulus arvensis, Cynadon dactylon, Digetaria marginata, Orobanche, Portulaca quadrifolia, Raphanus raphamistrum, Sinapis arvensis, Solanum nigrum, Sonchus oleraceus, Sorghum halepense and Tribulus terrestris was due to solarization (Cartia, 1985). There was significant reduction in count and dry weight of weeds due to solarization with transparent polyethylene (Braun et al., 1987). In Sicily, soil solarization decreased total weed seeds in the field by approximately 80 per cent. Population of Malva neglecta and Amaranthus retroflexus being reduced by 92 and 100 per cent respectively (Cartia, 1987).

In the solarization experiments on chickpea and pigeonpea, marked decrease in weed growth was obtained especially of annuals, but perennials such as cynadon and cyperus gradually recovered (Chauhan et al., 1988).

Daelemans (1989) reported that solarization for three months revealed pronounced reduction in population of Imperata cylindrica, Amaranthus retroflexus, Portulaca oleracea, Digetaria marginata and Ageratum conyzoides upto two months after planting of groundnut.

Soil solarization and summer ploughing significantly reduced the dry weed biomass by 54.6 per cent as compared to normal practice of carrying the operation before sowing. Soil solarization was superior to summer ploughing due to weed control and reduced incidence of pest like root-knot nematodes (Patel and Mehta, 1989). Best weed control was obtained with solarization for 30-50 days in the hot season (Sauerborn et al., 1989). Solarization for 67 days resulted in reduction of dicot weeds by 99 per cent and monocot weeds by 94 per cent at Torino, Italy (Tamietti and Garibaldi, 1989).

Solarization showed the greatest reduction of Sclerotia and Sclerotinia sclerotiarum in soil and there was a significant reduction in the population of weeds in solarized plots (Phillips, 1990). Solarization for 8 weeks reduced the number of weeds in lettuce and onion rows (Silveira et al., 1990). Soil solarization resulted in 91 per cent reduction of weeds mainly Cyperus rotundus, Digetaria ciliaris, Echinochloa crusgalli, Richardia scabra and Amaranthus

retroflexus (Stevens et al., 1990). Polyethylene mulching of wet soil for 30 days showed 67 per cent reduction in grass weed population which is due to higher heat conduction of wet soil and greater sensitivity of imbibed weed seeds to heat (Yaduraju and Ahuja, 1990).

Abu-Irmaileh (1991) reported that soil solarization with black polyethylene or clear polyethylene in large tomato field trials, completely eliminated both nodding and hemp broom rape during the growing season.

Kumar et al. (1993) observed that polyethylene mulching for 32 days decreased the emergence from seed of the dominant weeds Dactyloctenium aegyptium, Arachne racemosa, Trianthema monogyna and Cyperus rotundus by over 90 per cent. In transparent polyethylene 0.05 mm for 40 days, soil temperature exceeded lethal level on more occasions compared to other treatments and significantly reduced the dry weight and number of broom rape at harvest over control.

Ahmed et al. (1993) reported that solarization for two months during the hottest summer period effectively suppressed weeds of head lettuce during the season. Elmore (1983) found that soil solarization using single or double layers of polyethylene tarpaulin resulted in good to excellent control of Bermuda grass (Cynadon dactylon) within 6-14 weeks, total control of Johnson grass (Sorghum halepense) in 6-8 weeks.

Three to four weeks of solarization gave better weed control than pre-emergence herbicides and effectively controlled weeds like Portulaca oleracea, Digetaria sanguinalis, Solanum nigrum, Amaranthus spp. and other weeds (Vizantinopoulos and Katranis, 1993). The dry weight of spring and summer weeds after 50 days of solarization decreased by 89.2 and 90.3 per cent respectively (Linke, 1994).

Habeebur Rahman and Hosmani (1996) reported that there was significant reduction in count and dry weight of weeds due to solarization with transparent polyethylene. Maximum weed reduction was obtained by 0.05 mm for 40 days which was better than the normal practice of weed control.

2.1.5 Soil solarization on buried weed seeds

Rubin and Benzamin (1983) reported that an almost complete prevention of emergence of Sinapsis arvensis, Amaranthus retroflexus and Phalaris paradoxa, Rhizomes of Cynadon, Sorghum halepense and seeds of Portulaca, Solanum and Abutilon eventhough less susceptible, were significantly reduced. Leon et al. (1984) reported that weed seeds in plots under clear polyethylene mulch were killed more quickly than those in plots covered with black polyethylene mulch.

Solarization with transparent polyethylene for 40 days killed seeds of Commelina communis upto 11 cm but that of

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Cyperus sp. and Echinochloa crusgalli only upto 3-4 cm (Standifer et al., 1984). Polyethylene mulching for 32 days decreased the emergence from seed of the dominant weeds like Dactyloctenium aegyptium, Acrachne racemosa, Trianthema monogyna and Cyperus rotundus by 90 per cent (Kumar et al., 1993).

2.1.6 Effect of weed control through soil solarization on crop performance and yield

Grinstein et al. (1979) reported that solarization caused reduction of weeds and resulting in 52 per cent increase in yield of groundnut. Seedling emergence of wheat was hastened markedly under transparent polyethylene cover and slightly under black polyethylene cover (Chopra and Choudhary, 1980). Due to combined effect of reduction in damping off, root rot and weeds by solarization, yield of Phaseolus vulgaris was significantly increased (Fahim et al., 1987).

There was an increase in seed yield of pigeonpea from 0.4 to 1.1 t per ha and total dry matter accumulation from 1.4 to 3.5 t per ha mainly due to weed control and benefits other than disease control by solarization (Chauhan et al., 1988). Sesame crop grown one week after solarization for 45 days showed 72 per cent increase in seed yield over non-solarized plots due to 97-100 per cent reduction in weed

population and 92-100 per cent reduction in Macrophomina (Stapleton and Garza-Lopez, 1988).

Abu-Irmaileh (1991) reported that solariation for 6 weeks reduced broom rape infestation and improved crop yields. Seedling establishment of muskmelon, watermelon and sweet pepper and plant growth performance was markedly improved by plastic mulch (Wivutvongvana et al., 1991).

Gruenzweig et al. (1993) observed that tomato leaf showed significantly higher levels of chlorophyll and protein contents in plants from solarized soil compared to that of control. Maximum grain yield of sorghum (42.3 q/ha) was recorded by transparent polyethylene 0.05 mm for 40 days which was better than the normal practice of weed control (Habeebur Rahman and Hosmani, 1996).

2.1.7 Effect of soil solarization on availability of nutrients

Al-Kayssi et al. (1989) reported that raised temperature during solarization, can kill certain soil borne pathogens and weeds, it can also increase the concentration of soluble organic matter and minerals.

Corn, cucumber, sorghum, tobacco and tomato plants under controlled conditions revealed distinct increased growth responses (IGR) in solarised soil as compared to control. IGR was recorded in shoots of tomato seedlings, 15

days after transplanting and in roots only two weeks later (Gruezweig et al., 1993).

2.1.8 Chemical method of weed control

Pendimethalin at concentration of 0.1-5 ppm did not affect germination of rice seeds but was slightly inhibitory to seedling growth at the highest rates. Germination of seeds of Echinochloa crusgalli and Ischaemum rugosum was reduced at 2 and 5 ppm pendimethalin respectively (Bhatia and Sandhu, 1989). Pendimethalin at the rate of 1.5 kg/ha suppressed weed effectively (Choudhary and Pradhan, 1989).

Oxadiazon (0.75 kg/ha), butachlor (1 kg/ha) and pendimethalin (1.5 kg/ha) gave effective weed control mainly Echinochloa colonum, Echinochloa crusgalli, Cyperus difformis and Marsilea minuta, reducing their density from an unweeded value of 53.3 g/m^2 to 12.7-38.9 g/m^2 (Raju and Reddy, 1992).

Dry matter production of weeds reduced significantly with an increase in the dose of benthicarb and pendimethalin (Singh and Rahman, 1992).

Pendimethalin at 0.75 and 1 kg/ha provided effective weed control (more than 75%) and was safer to rice seedlings with only 11 per cent crop injury (Hari et al., 1993).

2.1.9 Ecological method of weed control

Harishkumar et al. (1992) reported that coir mat pandals recorded 61.4 per cent increase in transplantable seedlings of tobacco in the first pulling over conventional paddy straw. The cumulative production of seedlings is also more under coir mat pandals.

MATERIAL AND METHODS

III. MATERIAL AND METHODS

A field experiment was conducted during summer, 1996 to study the effect of soil solarization in nursery beds for the control of weeds. The details of the materials used and techniques adopted during the course of the investigation are described in this chapter.

3.1 Location of experimental site

The experiment was conducted at the Agronomy Field Unit, Main Research Station (MRS), Hebbal, University of Agricultural Sciences, Bangalore, during summer 1996. The Main Research Station is situated at a latitude of 12°58' North, longitude of 77°35' East and at an altitude of 899 meters above mean sea level.

3.2 Soil characters

The methods followed and the mean values of soil physical and chemical characters obtained from soil analysis of the experimental area are presented in Table 3.1.

The soil texture of the experimental site was sandy loam. The coarse sand, fine sand, silt and clay contents of the soil were 53.10, 27.15, 8.25 and 11.5 per cent, respectively. The bulk density of the soil was 1.51 g/cc and the particle density was 2.64 g/cc. The soil was slightly acidic in reaction (pH 6.4) with an electric

Table 3.1 Physical and chemical properties of soil at the experimental site, Main Reseakch Station, Hebbal, Bangalore.

Sl. No.	Particulars	Value	Method followed
I.	Physical properties		
	Mechanical analysis (% on oven dry basis)		
1.	Coarse sand	53.10	International Pipette method (Piper, 1966)
2.	Fine sand	27.15	
3.	Silt	8.25	
4.	Clay	11.50	
5.	Textural class	Sandy loam	
II.	Chemical properties		
1.	Soil pH	6.4	Beckman's Zerometric pH meter (Piper,1966)
2.	EC (dSm^{-1})	0.21	Conductivity bridge (Jackson, 1973)
3.	CEC (me/100 g)	8.5	Neutral normal NH_4OAC (Jackson, 1973)
4.	Organic carbon (%)	0.37	Walkley and Blacks wet oxidation method (Piper, 1966)
5.	Available nitrogen (kg/ha)	260.25	Alkaline permanganate method (Subbiah and Asija, 1956)
6.	Available P_2O_5 (kg/ha)	46.00	Olsen's method (Jackson, 1973)
7.	Available K_2O (kg/ha)	232.00	Neutral Normal NH_4OAC (Jackson, 1973)

conductivity of 0.21 dS/m. The soil was low in available nitrogen (260.25 kg/ha), high in available phosphorus (46 kg P_2O_5/ha) and medium in available potassium (232 kg K_2O/ha). The soil was low in organic carbon content (0.37%) with a low CEC of 8.5 me/100 g of soil.

3.3 Climatic condition

The normal as well as the actual weather and deviation from the normal with respect to rainfall, maximum and minimum temperatures, mean relative humidity, mean daily sunshine hours and open pan evaporation for the period under study are presented in Table 3.2.

3.3.1 Normal climatic conditions

The total rainfall received was 436.99 mm. The mean maximum temperature was more in the month of April (34°C) and less in the month of August (28.2°C). The mean minimum temperature was less in the month of August (19.6°C).

The mean relative humidity was more in the month of August (78.4%). The mean daily sunshine hours was less in the month of July (5.3°C) and August (5.3°C). Mean open pan evaporation was more in the month of April (6.4 mm/day) and May (6.4 mm/day).

Table 3.2 Normal (mean of 1986 to 1995) and actual (1996) monthly meteorological data prevailed at Main Research Station, University of Agricultural Sciences, Hebbal, Bangalore.

Months	Total rainfall (mm)			Mean maximum temperature (°C)			Mean minimum temperature (°C)			Relative humidity (%)			Mean daily sunshine hours			Open evaporation (mm/day)		
	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D	N	A	D
April	22.79	32.00	9.21	34.00	33.20	-0.80	22.40	21.50	-0.90	57.60	63.00	5 40	8.90	8.70	-0.20	6.40	6.50	0.10
May	83.43	86.40	2.97	32.90	34.90	2.00	21.00	21.70	0.70	63.80	58.00	-5.80	7.50	8.30	0.80	6.40	7.30	0.90
June	79.54	227.10	147.56	30.30	29.50	-0.80	20.40	20.50	0.10	62.70	74.50	11.80	6.40	7.20	0.80	5.50	4.70	-0.80
July	85.04	45.00	-40.04	28.80	29.30	0.50	19.80	20.30	0.50	75.40	72.50	-2.90	5.30	5.70	0.40	4.90	5.60	0.70
August	166.19	181.70	21.51	28.20	28.20	0.00	19.60	19.80	0.20	78.40	76.00	-2.40	5.30	5.90	0.60	4.10	4.60	0.50
Total RF	436.99	572.20	135.21															

N = Normal; A = Actual; D = Deviation from normal

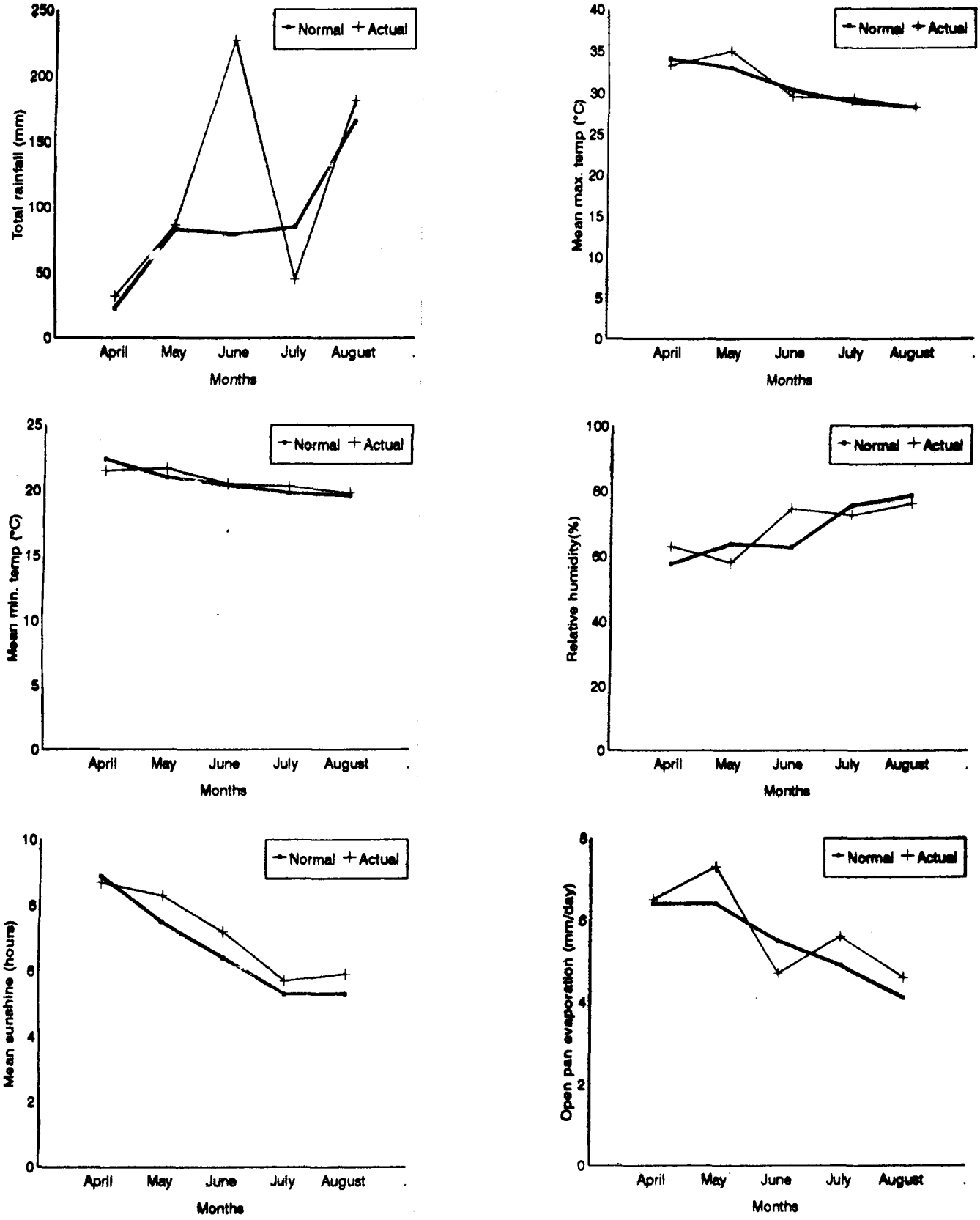


Fig.3.1:Normal (mean of 1986 to 1995) and actual (1996) weather prevailed during the crop growth period.

3.3.2 Climatic condiions during the cropping period

The total rainfall received during the period of experimentation (April 1996 to August 1996) was 572.2 mm. This was more than the normal rainfall by 135.21 mm. The rainfall was less than the normal in the month of July (-40.04 mm).

The mean maximum temperature was less than the normal in the months of April (-0.8°C) and June (-0.8°C). The mean maximum temperature was more than the normal in the months of May (+2.0°C) and July (+0.5°C).

The mean minimum temperature was more than the normal in the month of May (+0.7°C), June (+0.1°C), July (+0.5°C) and August (+0.2°C).

The mean relative humidity was less than the normal in the months of May (-5.8%), July (-2.9%) and August (-2.4%). The mean daily sunshine hours was more than the normal in the months of May (+0.8 hr), June (+0.8hr), July (+0.4 hr) and August (+0.6 hr).

The mean open pan evaporation was more than the normal in the months of April (+0.1 mm/day), May (0.9 mm/day) and August (+0.5 mm/day).

3.4 Cropping history

The experimental area was under fallow during rabi season of 1995-96.

3.5 Experimental details

3.5.1 Treatments

The experiment consisted of ten treatment combinations which are given below.

T_1 : Soil solarization with transparent polyethylene mulch (0.05 mm) for 15 days.

T_2 : Soil solarization with transparent polyethylene mulch (0.05 mm) for 30 days.

T_3 : Soil solarization with black polyethylene mulch (0.05 mm) for 15 days.

T_4 : Soil solarization with black polyethylene mulch (0.05 mm) for 30 days.

T_5 : Mulching with coir pith (5 t/ha)

T_6 : Mulching with pongamia leaves (5 t/ha)

T_7 : Mulching with glyricidia leaves (5 t/ha)

T_8 : Pre-emergent application of pendimethalin (1 kg a.i./ha)

T_9 : No solarization - Unweeded control

T_{10} : No solarization - Hand weeding 20 days after sowing.

3.5.2 Crops and varieties

The details regarding crops and varieties are furnished in Table 3.3.

Table 3.3 The details of crop, variety, fertilizer, spacing and seed rate used in the experiment.

Sl. No.	Crop	Variety	Fertilizer (kg/60 sq.m)			Spacing (cm)	Seed rate/ 60 sq.m
			N	P	K		
1.	Finger millet	HR-911	0.7	0.8	0.5	7.50	1 kg
2.	Paddy	Jaya	0.5	1.0	0.8	7.50	2 kg
3.	Chilli	Jwala	0.9	0.8	0.8	8.00	750 g
4.	Tomato	Pusa Ruby	0.9	0.9	0.8	8.00	350 g
5.	Capsicum	California Wonder	0.9	0.8	0.8	8.00	500 g
6.	Tobacco	KST-19	0.9	0.8	0.8	8.00	6 g

3.5.3 Design and layout

The experiment was laid out using Randomized complete block design (RCBD) design with three replications. The plan of layout of the experiment is given in Fig. 3.2.

3.5.4 Bed size

2 m x 1 m = 2 sq.m

3.5.5 Herbicide used

The herbicide used in the experiment was pendimethalin (Stomp 30% EC). It belongs to dinitro aniline group. The chemical name is N-(1-ethyl propyl)-3,4 dimethyl 2, 6 dinitro benzene amine. It is used mainly for the control of annual grasses and broad leaved weeds in corn, cotton, soybean, tobacco and rice. It is used as pre-emergence and also applied as a pre-plant soil incorporation.

3.6 Cultural practices

3.6.1 Land preparation

The land was ploughed with tractor drawn mould board plough and brought to good tilth by passing cultivator. The experimental area was laid out with raised beds. The weeds were removed, clods were crushed and the beds were levelled.

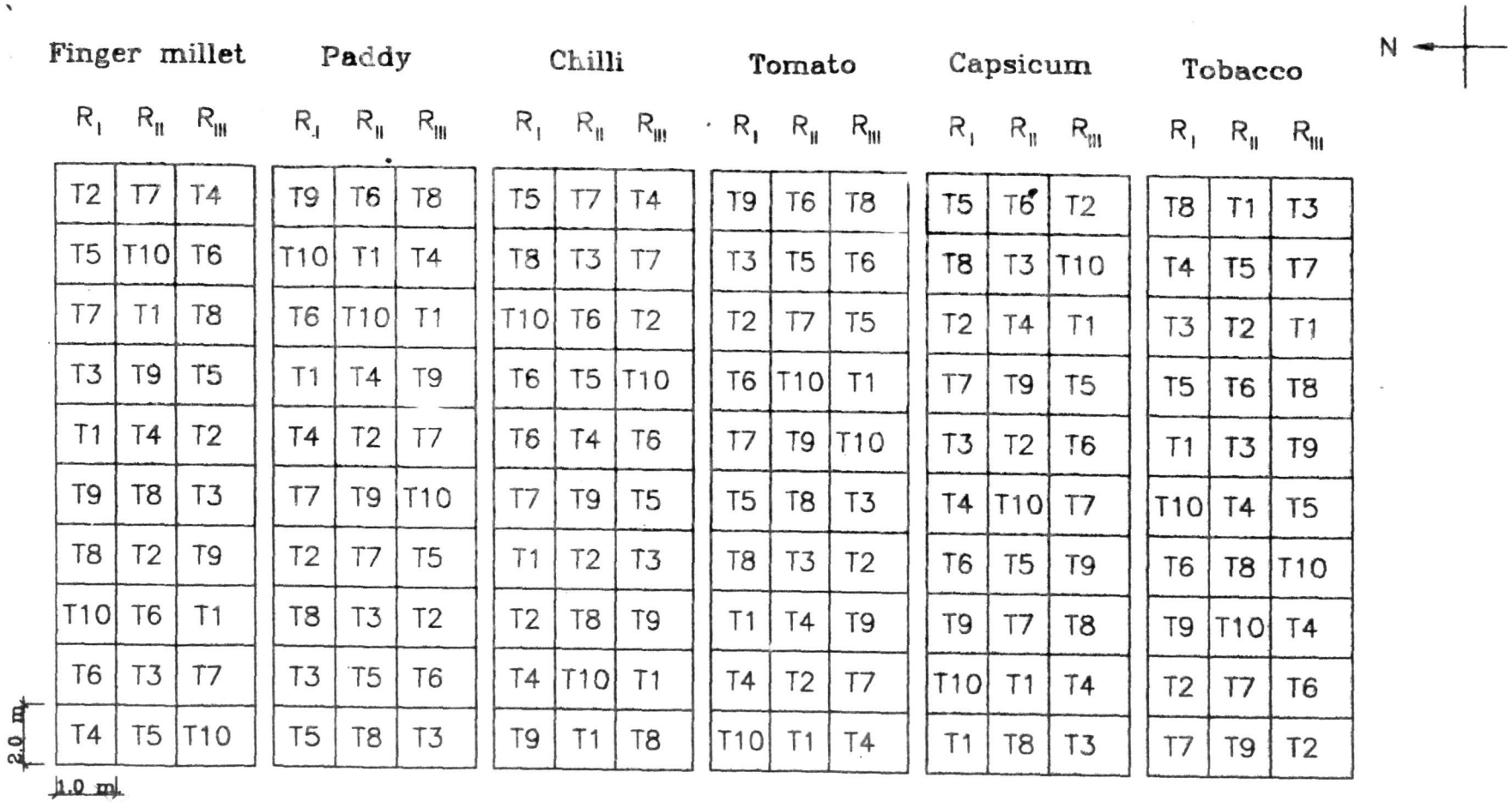


Fig. 3.2: PLAN OF LAYOUT OF THE FIELD EXPERIMENT

INDEX:

T1: Soil solarization with transparent polyethylene mulch for 15 days.
T2: Soil solarization with transparent polyethylene mulch for 30 days.
T3: Soil solarization with Black polyethylene mulch for 15 days.
T4: Soil solarization with Black polyethylene mulch for 30 days.
T5: Mulching with coir pith.
T6: Mulching with pongamia leaves.
T7: Mulching with glyricidia leaves.
T8: Pre-emergent application of pendimenthalin
T9: No solarization – unweeded control
T10: No solarizatin – Hand weeding 20 days after sowing.

3.7 Experimental details

3.7.1 Spreading of mulches

Polyethylene sheets were spread after irrigating the beds on 30-4-1996. The free sides of the polyethylene sheets were buried in the soil to avoid entry of air into the soil. Coir pith, pongamia leaves and glyricidia leaves were also spread on the bed on 30-4-1996.

3.7.2 Removal of polyethylene sheets

After 15 days of soil solarization, transparent and black polyethylene sheets were removed on 15-5-1996 and for 30 days of soil solarization on 30-5-1996.

3.7.3 Fertilizer application

Recommended doses of nitrogen, phosphorus and potassium were applied to each bed for different crops at the time of sowing has been presented in Table 3.3.

3.7.4 Sowing

The seeds were sown in lines at a distance of 7.5 cm in case of finger millet and paddy and 8 cm in case of chilli, tomato, capsicum and tobacco on 6-6-1996.

3.7.5 Pre-emergence herbicide application

Pendimethalin was sprayed one day after sowing with the help of a hand operated knap sack sprayer and the spray volume used was 700 litres per ha.

3.7.6 Irrigation

The seed beds were watered daily till germination and on alternate days after germination till they are ready for transplanting.

3.7.6 Uprooting of seedlings

Seedlings were uprooted after 30 days of sowing in case of paddy, finger millet, chilli, tomato and capsicum and in tobacco, after 45 days of sowing.

3.8 Details of collection of experimental data

Observations on weed count were recorded in 0.25 sq.m area at weekly intervals of crop growth. For the dry matter production of both crop and weeds, destructive sampling area was utilized. In 0.25 sq.m area total number of plants germinated was recorded after one week of germination.

Growth components namely plant height, root length and shoot length were recorded at weekly intervals.

The details of each of these observations viz., the sampling interval, sample size and the method followed in taking each observation have been described below.

3.8.1 Observations on soil temperature

Soil temperature was recorded during soil solarization period at 5 days intervals between 2.30 to 3.30 p.m. with soil thermometers. Soil temperature was recorded at two depths 5 cm and 10 cm in each bed and for each depth, two spots were taken in each bed for measuring the soil temperature.

3.8.2 Observations on weed growth

3.8.2.1 Weed count

Observations on monocot, dicot, sedge and total weed populations were recorded from the permanently fixed 0.25 sq.m area at weekly intervals.

3.8.2.2 Dry matter production of weeds (g/0.25 m^2)

Dry matter production of weeds at weekly intervals were recorded from 0.25 m^2 area in the destructive sampling unit. Weeds were removed from 0.25 m^2 area, washed to remove adhered soil, oven dried at65°C till a constant weight was attained, then the weight of monocot, dicot and sedges were recorded separately.

3.8.3 Observations on growth parameters

The mean values of five plants was expressed in all biometric observations..

3.8.3.1 Germination percentage

The total number of plants germinated in 0.25 m^2 area was considered and compared with the recommended plant population.

3.8.3.2 Root length (cm)

Root length was measured from the tip of the root to the base of the stem at weekly intervals.

3.8.3.3 Root vigour

It was calculated as the product of root length and germination percentage at weekly intervals.

3.8.3.4 Shoot length (cm)

Shoot length was measured from the ground level to the apex of the stem at weekly intervals.

3.8.3.5 Shoot vigour

It was calculated as the product of shoot length and germination percentage at weekly intervals.

3.8.3.6 Plant height (cm)

Plant height was measured from the base of the stem to the tip of the leaf at weekly intervals.

3.8.3.7 Dry matter production (g/plant)

Five plants were randomly selected and carefully uprooted, roots were washed to remove the soil and were oven dried. Total weight (root and shoot) was recorded and expressed in g/plant, at weekly intervals.

3.9 Economics of weed contrl

To calculate the economics of weed control treatments by soil solarization, the costs of polyethylene sheets were considered. Economics of weed control treatment involving hand weeding, mulching with coir pith, pongamia leaves, glyricidia leaves and pendimethalin application was also worked out. Benefit : cost ratio was worked out with the total cost of cultivation and gross returns.

3.10 Statistical analysis of data

3.10.1 Transformation of data

Data on weed count and weed dry weight showed high variation. To make the data and analysis of variance more valid, the data were subjected to square root transformation using the formula.

$$Y = \sqrt{X + 0.5}$$

where, Y = transformed value
X = Original value

3.10.2 Statistical analysis and interpretation of the data

Data were analysed statistically for the test of significance following the Fischer's method of "Analysis of variance" as outlined by Sunderraj et al. (1972). The level of significance in `F' test was tested at 0.05 probability. The interpretation of the data was done using critical difference (C.D.) value calculated at 0.05 probability.

The correlation coefficients were worked out for weed count and weed dry weight with temperature. The results have been discussed at the probability level of five per cent.

EXPERIMENTAL RESULTS

IV. EXPERIMENTAL RESULTS

The results of the studies on "Soil solarization for weed control in nursery beds" are presented in this chapter.

4.1 Weed flora of the experimental site

The weed species noticed in the experimental field were Cynadon dactylon Pers., Digetaria marginata Link., Echinochloa colonum (L.) Link., Dactyloctenium aegyptium Beauv., Commelina bengalensis L., Erogrostis biforia (Wight) Bor., among monocots and Cleome viscosa L., Desmodium triflorum DC., Eclipta alba Hassk., Euphorbia hirta L., Leucas aspera (Willd.) Link., Tridax procumbens L., Bidens pilosa L., Borreria articularis K. Schum., Borreria stricta L., among dicots and the only sedge that was observed was Cyperus rotundus L.

4.2 Variation in soil temperature during soil solarization

4.2.1 Soil temperature in finger millet nursery

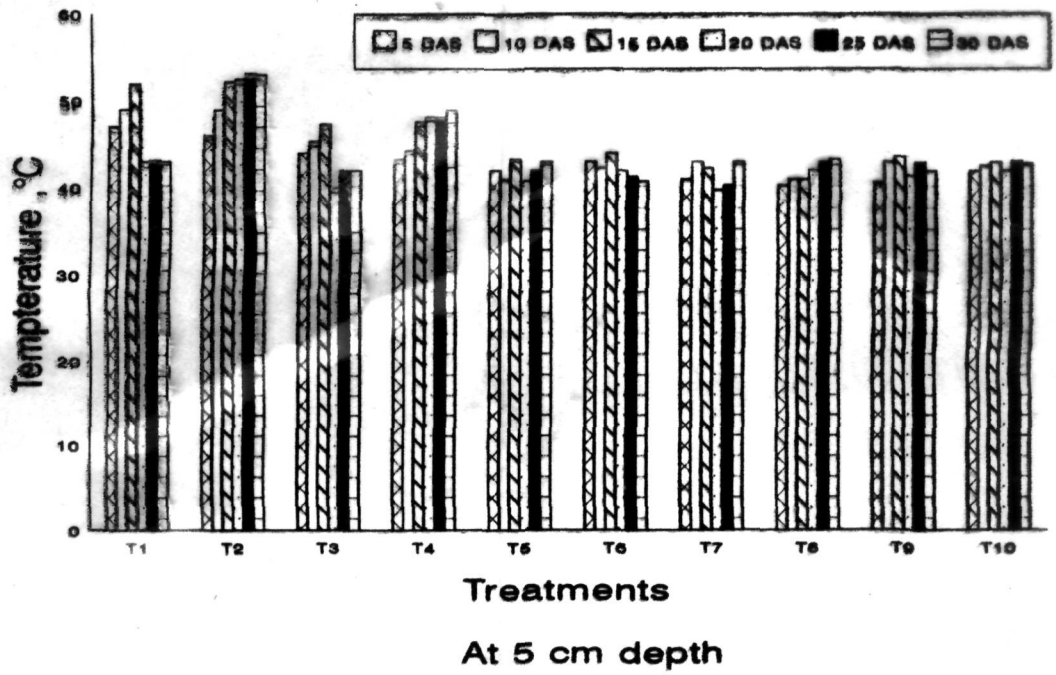
The data on variation in soil temperature during soil solarization at 5 and 10 cm depths are presented in Table 4.1a and Fig.4.1a.

In finger millet, till 30 days after the spreading, soil temperature at both 5 cm and 10 cm soil depths was found significant among the treatments.

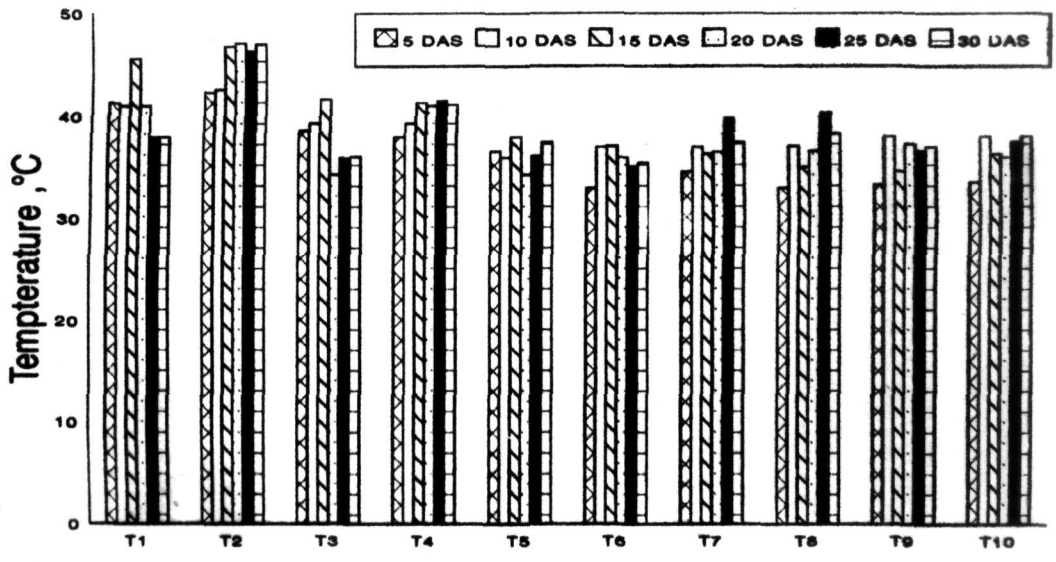
Table 4.1a Effect of weed control treatments on soil temperature (°C) at 5 cm and 10 cm depths during soil solarization period in finger millet nursery.

Treatments	Days after spreading											
	5		10		15		20		25		30	
	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm
T_1 : Soil solarization 15 days TP	47.0	41.3	49.0	41.0	52.0	45.6	43.0	41.0	43.1	38.0	43.0	38.0
T_2 : Soil solarization 30 days TP	46.0	42.6	49.0	42.6	52.3	46.8	52.6	47.1	53.3	46.3	53.1	47.0
T_3 : Soil solarization 15 days BP	44.0	38.6	45.3	39.3	47.3	41.6	40.0	34.3	42.0	36.0	42.0	36.1
T_4 : Soil solarization 30 days BP	43.3	38.0	44.3	39.3	47.6	41.3	48.1	41.0	48.1	41.5	49.0	41.1
T_5 : Mulching with coir pith at 5 t/ha	42.0	36.6	41.0	36.0	43.3	38.0	40.8	34.3	42.0	36.1	43.0	37.5
T_6 : Mulching with Pongamia leaves at 5 t/ha	43.0	33.0	42.3	37.0	44.0	37.1	42.0	36.0	41.3	35.1	40.8	35.5
T_7 : Mulchng with glyricidia leaves at 5 t/ha	41.0	34.6	43.0	37.0	42.3	36.3	39.8	36.5	40.3	39.8	43.0	37.5
T_8 : Pendimethalin 1 kg ai/ha	40.3	33.0	41.0	37.1	41.0	35.0	42.1	36.6	43.0	40.3	43.3	38.3
T_9 : Unweeded control	40.6	33.3	43.0	38.0	43.6	34.6	41.5	37.3	43.0	36.6	42.0	37.0
T_{10} : Hand weeding at 20 DAS	42.0	33.6	42.6	38.0	43.0	36.3	42.1	36.0	43.1	37.5	42.8	38.0
F test	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	1.52	1.42	0.94	1.22	1.32	1.19	0.86	1.81	0.94	2.15	0.95	1.23
C.D. at 0.05	3.19	2.97	1.97	2.55	2.77	2.49	1.80	1.61	1.98	4.51	1.99	2.58

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing



At 5 cm depth



At 10 cm depth

DAS: Days after spreading

Fig.4.1a: Effect of weed control treatments on soil temperature (°C) at 5 cm and 10 cm depths during soil solarization period in finger millet nursery.

During 5 days after spreading, maximum soil temperature at 5 cm (47°C) and 10 cm (42.6°C) was recorded in soil solarization with TP for 15 days and 30 days respectively and was significant over control at 5 cm (40.6°C) and 10 cm (33.3°C) and other mulching treatments.

During 10 days after spreading, maximum soil temperature at 5 cm (49°C) and 10 cm (42.6°C) was recorded in soil solarization with TP for 15 and 30 days and 30 days respectively and was significant over other treatments.

During 15 days after spreading, maximum soil temperature at 5 cm (52.3°C) and 10 cm (46.8°C) was recorded in soil solarization with TP for 30 days and was significant over control (43.6°C and 34.6°C, respectively) and other mulching treatments. Mulching with coir pith, pongamia leaves and glyricidia leaves did not differ significantly with each other.

During 20 days after spreading, maximum soil temperature recorded in soil solarization with TP for 30 days at 5 cm (52.6°C) and 10 cm (47.1°C) depth and was significant over other mulching treatments.

During 25 days after spreading, maximum soil temperature recorded in soil solarization with TP for 30 days at 5 cm (53.3°C) and 10 cm (46.3°C) depth and was significant with black polyethylene for 30 days at 5 cm (48.1°C) and

10 cm (41.5°C) depth and was significant over control (43°C and 36.6°C, respectively).

During 30 days after spreading, maximum soil temperature recorded in soil solarization with TP for 30 days at 5 cm (53.1°C) and 10 cm (47°C, depth. Mulching with coir pith, pongamia leaves and glyricidia leaves did not differ significantly with each other.

4.2.2 Soil temperature in paddy nursery

The data on variation in soil temperature at 5 and 10 cm depths are presented in Table 4.1b and Fig.4.1b.

In paddy, till 30 days after spreading the mulch, soil temperature at both 5 cm and 10 cm soil depths was found significant among the treatments.

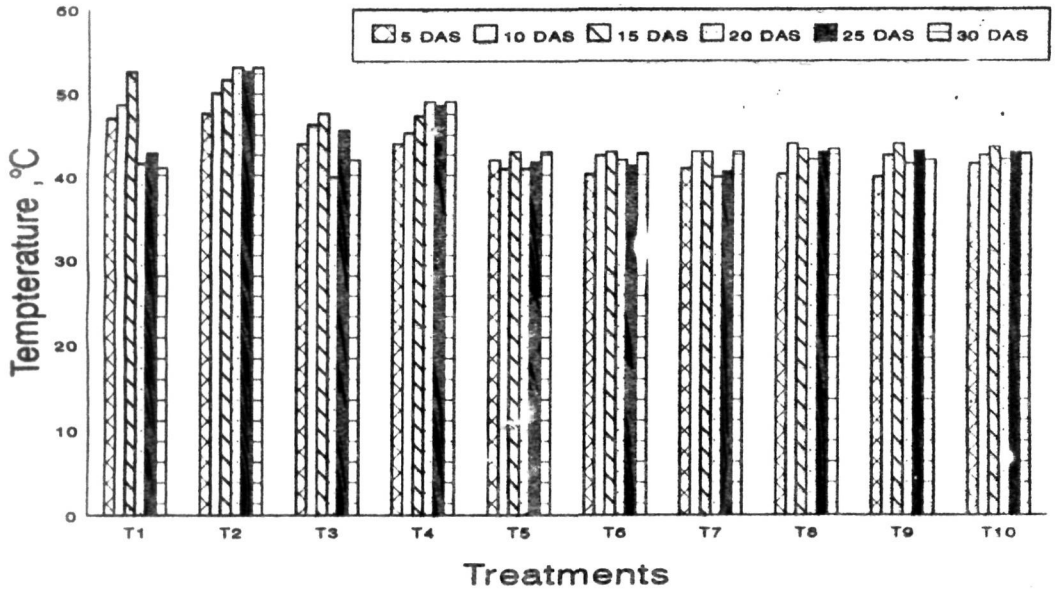
During 5 days after spreading,maximum soil temperature at 5 cm (47.6°C) and 10 cm (42.3°C) was recorded in soil solarization with TP for 30 days and was significant over control (40.0°C and 33.3°C, respectively). Mulching with coir pith, pongamia leaves and glyricidia leaves were found on par with each other.

During 10 days after spreading,maximum soil temperature at 5 cm (50°C) and 10 cm (42.8°C) was recorded in soil solarization with TP for 30 days and was significant over control (42.6 and 38.1°C, respectively). Black polyethylene

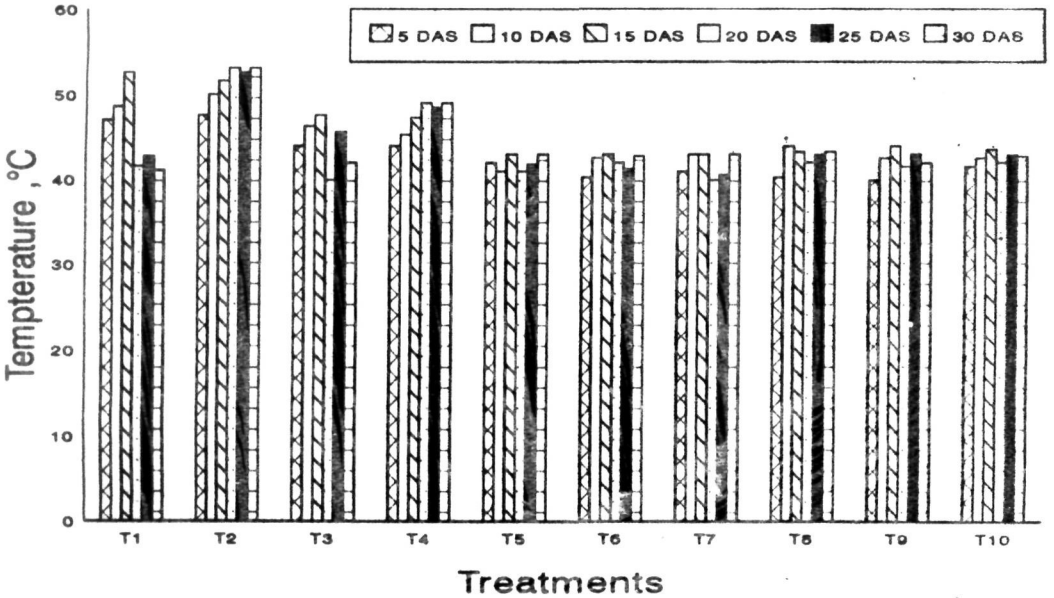
Table 4.1b Effect of weed control treatments on soil temperature (°C) at 5 cm and 10 cm depths during soil solarization period in paddy nursery.

Treatments	Days after spreading											
	5		10		15		20		25		30	
	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm
T_1 : Soil solarization 15 days TP	47.0	41.3	48.6	41.3	52.6	47.0	41.6	39.0	42.8	39.0	41.1	37.5
T_2 : Soil solarization 30 days TP	47.6	42.3	50.0	42.8	51.6	45.3	53.1	47.8	52.6	47.0	53.1	48.5
T_3 : Soil solarization 15 days BP	44.0	39.3	46.3	41.3	47.6	42.6	40.0	32.3	45.6	36.5	42.0	36.3
T_4 : Soil solarization 30 days BP	44.0	39.1	45.3	39.6	47.3	40.0	49.0	43.0	48.5	41.8	49.0	41.3
T_5 : Mulching with coir pith at 5 t/ha	42.0	38.1	41.0	37.3	43.0	36.3	41.0	34.3	41.8	36.6	43.0	36.8
T_6 : Mulching with Pongamia leaves at 5 t/ha	40.3	33.6	42.6	37.0	43.0	36.6	42.0	36.3	41.3	34.8	42.8	35.8
T_7 : Mulchng with glyricidia leaves at 5 t/ha	41.0	34.3	43.0	38.0	43.0	36.3	40.0	33.0	40.6	33.3	43.0	36.1
T_8 : Pendimethalin 1 kg ai/ha	40.3	34.0	44.0	35.5	43.3	37.3	42.1	35.5	43.0	37.1	43.3	38.1
T_9 : Unweeded control	40.0	33.3	42.6	38.1	44.0	36.1	41.6	35.8	43.1	36.6	42.0	37.6
T_{10} : Hand weeding at 20 DAS	41.6	33.6	42.6	35.5	43.6	36.6	42.1	36.0	43.0	38.0	42.8	35.8
F test	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	1.43	1.19	1.67	1.08	1.25	1.07	0.90	1.17	1.45	0.76	0.67	1.24
C.D. at 0.05	3.01	2.49	3.54	2.26	2.61	2.25	1.88	2.46	3.04	1.58	1.41	2.59

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing



At 5 cm depth



At 10 cm depth

DAS: Days after spreading

Fig.4.1b: Effect of weed control treatments on soil temperature (°C) at 5 cm and 10 cm depths during soil solarization period in paddy nursery.

for 30 days at 5 cm (45.3°C) and 10 cm (39.6°C) depth did not differ significantly with black polyethylene for 15 days at 5 cm (46.3°C) and 10 cm (41.3°C) depth.

During 15 days after spreading, maximum soil temperature was recorded in soil solarization with TP for 15 days at 5 cm (52.6°C) and 10 cm (47°C) depth and was significant over control (44°C and 36.1°C, respectively). Mulching with coir pith, pongamia leaves and glyricidia leaves were found on par with each other.

During 20 days after spreading, maximum soil temperature was recorded in soil solarization with TP for 30 days (53.1°C and 47.8°C) at 5 cm and 10 cm depth respectively and differed significantly over other mulching treatments.

During 25 days after spreading, maximum soil temperature was recorded in soil solarization with TP for 30 days at 5 cm (52.6°C) and at 10 cm (47°C) depth and differed significantly with control (43.1°C and 36.6°C, respectively).

During 30 days after spreading, maximum soil temperature was recorded in soil solarization with TP for 30 days at 5 cm (53.1°C) and 10 cm (48.5°C) and was significant over control (42.0°C and 37.6°C, respectively) and other mulching treatments.

4.2.3 Soil temperature in chilli nursery

The data on variation in soil temperature during soil solarization at 5 and 10 cm depths are presented in Table 4.1c and Fig. 4.1c.

In chilli, till 30 days after spreading the mulch, soil temperature at both 5 cm and 10 cm soil depths was found significant among the treatments.

During 5 days after spreading, maximum soil temperature at 5 cm (47.6°C) and 10 cm (42.6°C) depth was recorded in soil solarization with TP for 30 days and was significant in soil solarization with BP for 30 days at 5 cm (43.6°C) and 10 cm (38.5°C) depth.

During 10 days after spreading, maximum soil temperature at 5 cm (50°C)and 10 cm (43°C) was recorded in soil solarization with TP for 30 days and was significant over the control (43.6°C and 38.1°C, respectively).

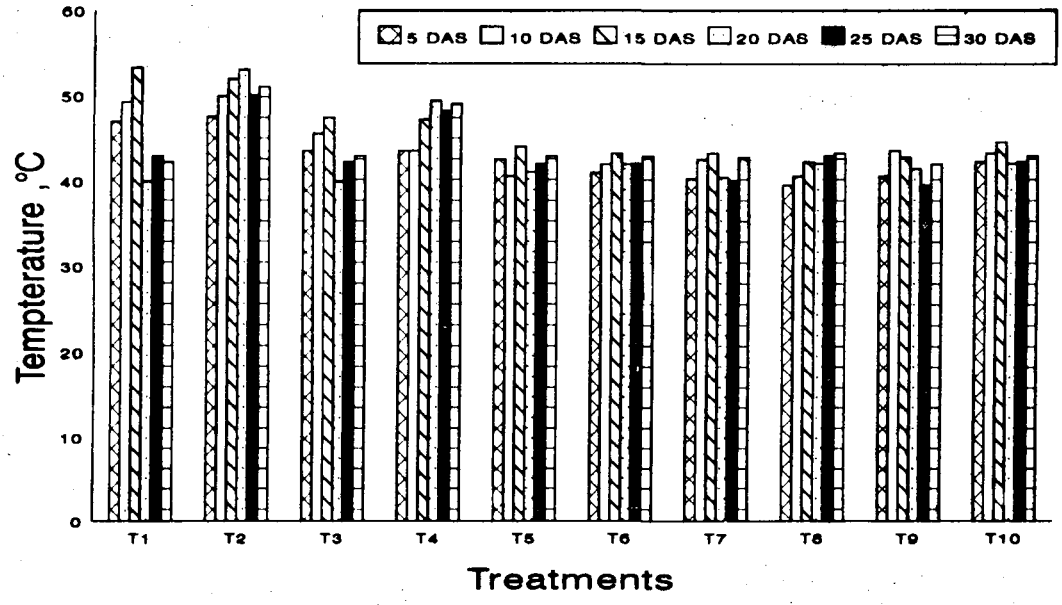
During 15 days after spreading, maximum temperature was recorded in soil solarization with TP for 15 days at 5 cm (53.3°C) and 10 cm (48.1°C) depth and was significant over the control (42.8°C and 35.0°C, respectively).

During 20 days after spreading, maximum soil temperature was recorded in solarization with TP for 30 days

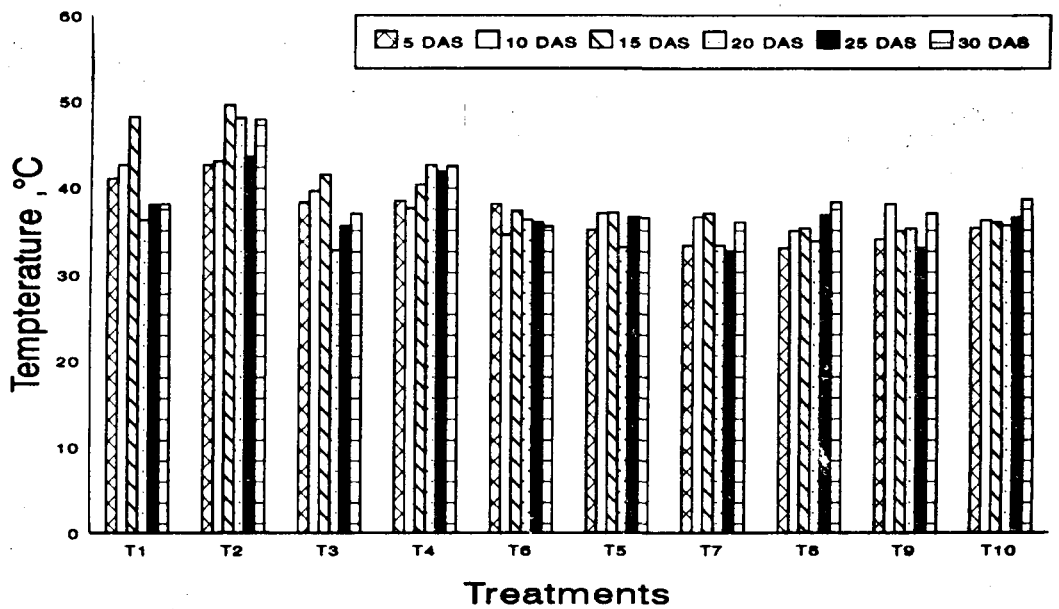
Table 4.1c Effect of weed control treatments on soil temperature (°C) at 5 cm and 10 cm depths during soil solarization period in chilli nursery.

Treatments	Days after spreading											
	5		10		15		20		25		30	
	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm
T_1 : Soil solarization 15 days TP	47.0	41.0	49.3	42.6	53.3	48.1	40.0	36.3	43.0	38.0	42.3	38.1
T_2 : Soil solarization 30 days TP	47.6	42.6	50.0	43.0	52.0	43.5	53.1	48.0	50.1	43.5	51.1	47.8
T_3 : Soil solarization 15 days BP	43.6	38.3	45.6	39.6	47.5	41.5	40.0	32.8	42.3	35.6	43.0	37.0
T_4 : Soil solarization 30 days BP	43.6	38.5	43.6	37.6	47.3	40.3	49.5	42.6	48.3	41.8	49.1	42.5
T_5 : Mulching with coir pith at 5 t/ha	42.6	38.1	40.6	34.6	44.1	37.3	41.1	33.1	42.1	36.3	43.0	36.5
T_6 : Mulching with Pongamia leaves at 5 t/ha	41.0	35.1	42.0	37.0	43.3	37.1	42.0	36.3	42.1	36.0	43.0	35.5
T_7 : Mulchng with glyricidia leaves at 5 t/ha	40.3	33.3	42.6	36.6	43.3	37.0	40.5	33.3	40.1	32.6	42.8	36.0
T_8 : Pendimethalin 1 kg ai/ha	39.6	33.0	40.6	35.0	42.3	35.3	42.1	33.8	43.0	36.8	43.3	38.3
T_9 : Unweeded control	40.6	34.0	43.6	38.1	42.8	35.0	41.5	35.3	39.6	33.0	42.0	37.0
T_{10} : Hand weeding at 20 DAS	42.3	35.3	43.3	36.3	44.6	36.0	42.1	35.6	42.3	36.5	43.0	38.6
F test	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	1.28	1.31	1.56	1.24	0.97	1.78	0.86	0.96	1.76	1.07	0.68	0.76
C.D. at 0.05	2.69	2.75	3.28	2.60	2.04	3.74	1.81	2.02	3.69	2.24	1.41	1.59

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing



At 5 cm depth



At 10 cm depth

DAS: Days after spreading

Fig.4.1c: Effect of weed control treatments on soil temperature (°C) at 5 cm and 10 cm depths during soil solarization period in chilli nursery.

at 5 cm (53.1°C) and 10 cm (48°C) depth and differed significantly with soil solarization for 15 days with TP at 5 cm (40°C) and 10 cm (36.3°C) depth.

During 25 days after spreading, maximum soil temperature was recorded in soil solarization with TP for 30 days at 5 cm (50.1°C) and 10 cm (43.5°C) depth and differed significantly over the control at 5 cm (39.6°C) and 10 cm (33°C) depth. Mulching with coir pith, pongamia leaves and glyricidia leaves were found on par with each other.

During 30 days after spreading, maximum soil temperature was recorded with TP at 5 cm (51.1°C) and 10 cm (47.8°C) depth for 30 days and differed significantly over control at 5 cm (42.0°C) and 10 cm (37.0°C) depth.

4.2.4 Soil temperature in tomato nursery

The observations recorded on variation in soil temperature at 5 and 10 cm depths are presented in Table 4.1d and Fig.4.1d.

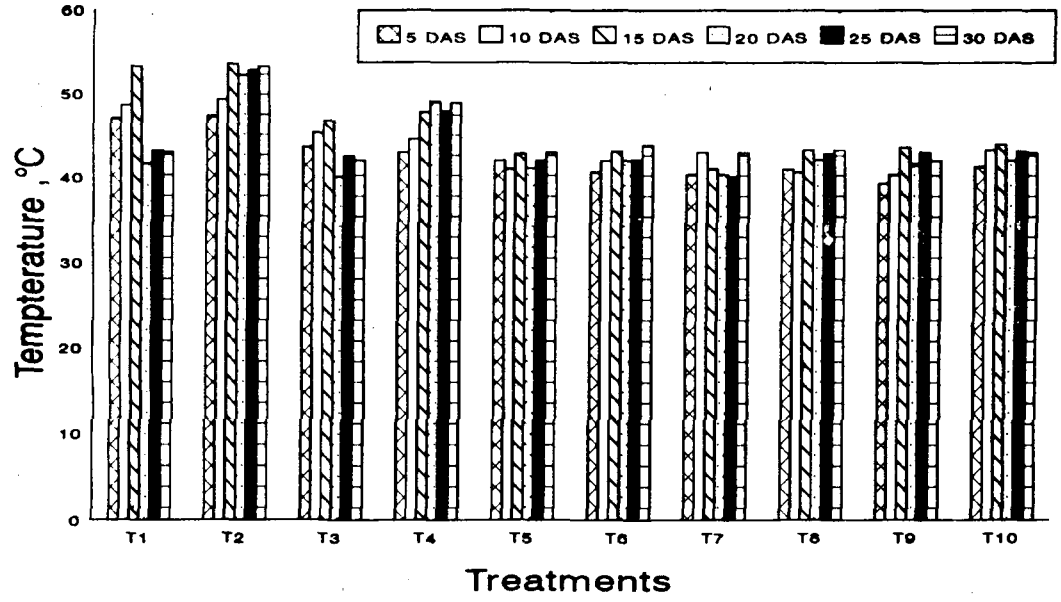
In tomato, till 30 days after spreading the mulch, soil temperature at both 5 cm and 10 cm soil depths was found significant among the treatments.

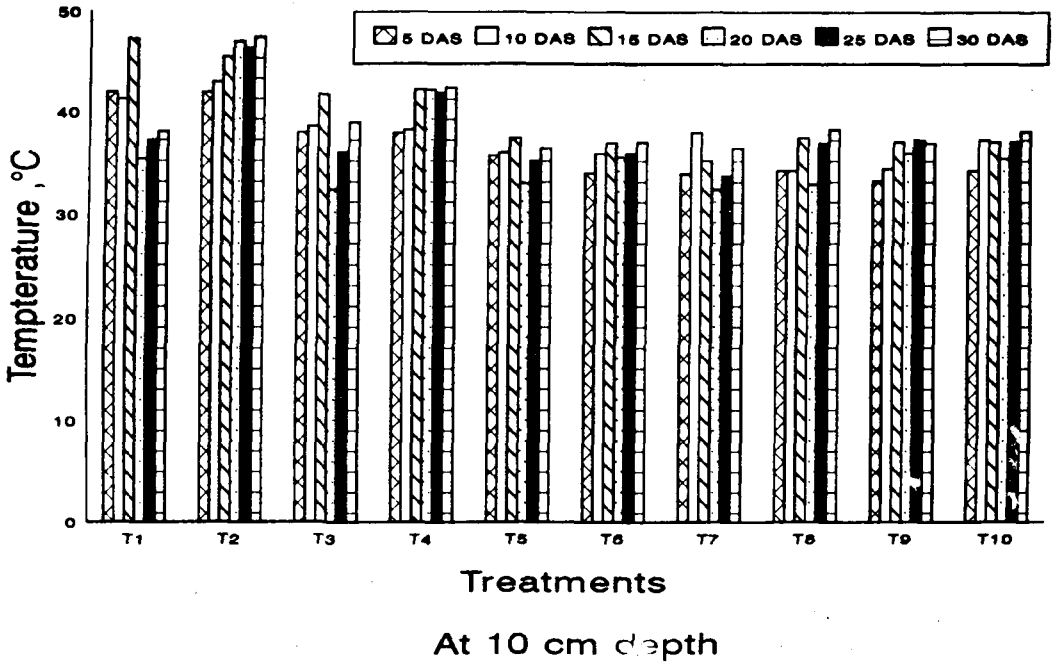
During 5 days after spreading, soil temperature at 5 cm (47.3°C) and 10 cm (42.0°C) depth was recorded maximum in soil solarization with TP for 30 days and differed

Table 4.1d Effect of weed control treatments on soil temperature (°C) at 5 cm and 10 cm depths during soil solarisation period in tomato nursery.

Treatments	Days after spreading											
	5		10		15		20		25		30	
	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm
T_1 : Soil solarisation 15 days TP	47.0	42.0	48.6	41.3	53.3	47.3	41.6	35.5	43.1	37.3	43.0	38.1
T_2 : Soil solarisation 30 days TP	47.3	42.0	49.3	43.0	53.6	45.5	52.3	47.0	52.8	46.3	53.3	47.5
T_3 : Soil solarisation 15 days BP	43.6	38.0	45.6	38.6	46.8	41.8	40.1	32.5	42.5	36.1	42.0	39.0
T_4 : Soil solarisation 30 days BP	43.0	38.0	44.6	38.3	47.8	42.3	49.1	42.3	48.0	42.0	49.0	42.5
T_5 : Mulching with coir pith at 5 t/ha	42.0	35.8	41.0	36.1	42.8	37.5	41.1	33.1	42.0	35.3	43.0	36.5
T_6 : Mulching with Pongamia leaves at 5 t/ha	40.6	34.1	42.0	36.0	43.1	37.0	42.0	35.6	42.1	36.0	43.8	37.1
T_7 : Mulchng with glyricidia leaves at 5 t/ha	40.3	34.0	43.0	38.0	41.0	35.3	40.3	32.5	40.1	33.8	43.0	36.5
T_8 : Pendimethalin 1 kg ai/ha	41.0	34.3	40.6	34.3	43.3	37.5	42.1	33.0	42.8	37.0	43.3	38.3
T_9 : Unweeded control	39.3	33.0	45.3	34.5	43.6	37.1	41.6	36.0	43.0	37.3	42.0	37.0
T_{10} : Hand weeding at 20 DAS	41.3	34.3	43.3	37.3	44.0	37.1	42.0	35.5	43.1	37.1	43.0	38.1
F test	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	1.29	1.17	1.71	1.98	1.05	1.02	0.65	0.48	0.96	0.83	0.74	1.74
C.D. at 0.05	2.71	2.46	3.58	4.15	2.21	2.13	1.37	1.01	2.01	1.74	1.56	3.65

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing





DAS: Days after spreading

Fig.4.1d: Effect of weed control treatments on soil temperature (°C) at 5 cm and 10 cm depths during soil solarization period in tomato nursery.

significantly over control at 5 cm (39.3°C) and 10 cm (33.0°C) depth and other mulching treatments.

During 10 days after spreading, soil temperature at 5 cm (49.3°C) and 10 cm (43.0°C) was recorded maximum in soil solarization with TP for 30 days and followed by soil solarization with TP for 15 days at 5 cm (48.6°C) and 10 cm (41.3°C) depth.

During 15 days after spreading, soil temperature at 5 cm (53.6°C) and 10cm (47.3°C) depth was recorded maximum in soil solarization with TP for 30 days and 15 days respectively and was significant over control at 5 cm (43.6°C) and 10 cm (37.1°C) depth.

During 20 days after spreading, soil temperature at 5 cm (52.3°C) and 10 cm (47°C) depth in soil solarization with TP for 30 days was recorded maximum and was significant over soil solarization with TP for 15 days at 5 cm (41.6°C) and 10 cm (35.5°C) respectively.

During 25 days after spreading, soil solarization with TP for 30 days at 5 cm (52.8°C) and 10 cm (46.3°C) was recorded maximum and differed significantly over control at 5 cm (43.0°C) and 10 cm (37.3°C) depth.

During 30 days after spreading, soil solarization with TP for 30 days at 5 cm (53.3°C)and 10 cm (47.5°C) depth,

was recorded maximum and was significant in soil solarization with TP for 15 days (43.0°C and 38.1°C, respectively).

4.2.5 Soil temperature in capsicum nursery

The observation on variation in soil temperature at 5 and 10 cm depths are presented in Table 4.1e and Fig. 4.1e.

In capsicum, till 30 days after spreading the mulch, soil temperature at both 5 cm and 10 cm soil depths was found significant among the treatments.

During 5 days after spreading, soil temperature at both 5 cm (47.3°C) and 10 cm (41.6°C) depth was recorded maximum in soil solarization with TP for 30 days and differed significantly over control at 5 cm (40°C) and 10 cm (33.3°C) depth. Mulching with coir pith, pongamia leaves and glyricidia leaves were found on par with each other.

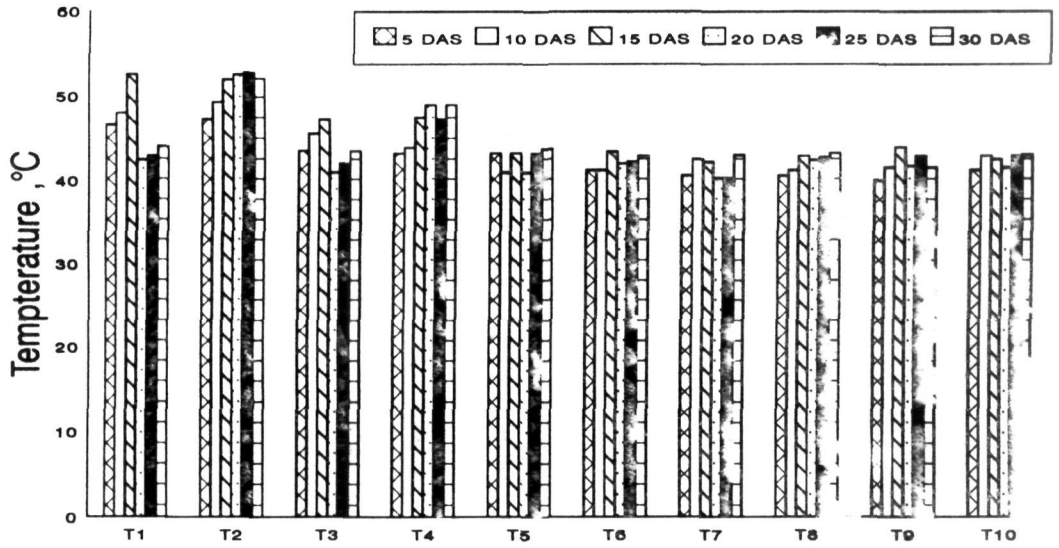
During 10 days after spreading, soil temperature at 5 cm (49.3°C) and 10 cm (42.6°C) depth was recorded maximum in soil solarization with TP for 30 days and was significant with soil solarization with BP for 30 days at 5 cm (44°C) and 10 cm (37°C) depth respectively.

During 15 days after spreading, maximum soil temperature was recorded in soil solarization with TP for 15 days at 5 cm (52.6°C) and at 10 cm (47.6°C) depth followed by

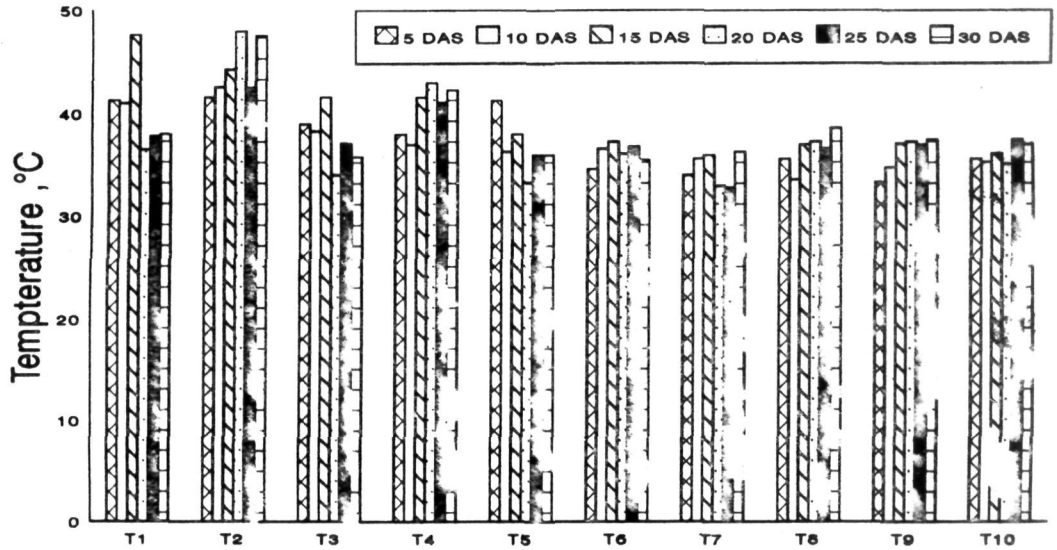
Table 4.1e Effect of weed control treatments on soil temperature (°C) at 5 cm and 10 cm depths during soil solarization period in capsicum nursery.

Treatments	Days after spreading											
	5		10		15		20		25		30	
	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm
T_1 : Soil solarization 15 days TP	46.6	41.3	48.0	41.0	52.6	47.6	42.5	36.5	43.0	37.8	44.1	38.0
T_2 : Soil solarization 30 days TP	47.3	41.6	49.3	42.6	52.0	44.3	52.6	48.0	52.8	42.5	52.1	47.6
T_3 : Soil solarization 15 days BP	43.6	39.0	45.6	38.3	47.3	41.6	41.0	34.0	42.1	37.1	43.6	35.8
T_4 : Soil solarization 30 days BP	43.3	38.0	44.0	37.0	47.5	41.6	49.0	43.0	47.3	41.1	49.0	42.3
T_5 : Mulching with coir pith at 5 t/ha	43.3	41.3	41.0	36.3	43.3	38.0	41.0	33.3	43.3	36.0	43.8	36.0
T_6 : Mulching with Pongamia leaves at 5 t/ha	41.3	34.6	41.3	36.6	43.5	37.3	42.1	36.1	42.3	36.8	43.0	35.5
T_7 : Mulchng with glyricidia leaves at 5 t/ha	40.6	34.0	42.6	35.6	42.3	36.0	40.3	33.0	40.3	32.8	43.1	36.3
T_8 : Pendimethalin 1 kg ai/ha	40.6	35.6	41.3	33.6	43.0	37.0	42.5	35.0	42.8	36.6	43.3	38.6
T_9 : Unweeded control	40.0	33.3	41.6	34.8	44.0	37.1	41.8	37.3	43.0	37.0	41.6	37.5
T_{10} : Hand weeding at 20 DAS	41.3	35.6	43.0	35.3	42.6	36.1	41.6	35.1	43.0	37.5	43.1	37.0
F test	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	1.43	2.02	1.26	1.58	1.30	1.31	0.69	0.93	0.77	1.28	1.03	0.76
C.D. at 0.05	3.00	4.23	2.63	3.30	2.73	2.74	1.44	1.95	1.62	2.68	2.17	1.60

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing



At 5 cm depth



At 10 cm depth

DAS: Days after spreading

Fig.4.1e: Effect of weed control treatments on soil temperature (°C) at 5 cm and 10 cm depths during soil solarization period in capsicum nursery.

soil solarization with TP for 30 days at 5 cm (52°C) and 10 cm (44.3°C).

During 20 days after spreading, soil temperature at 5 cm (52.6°C) and 10 cm (48°C) depth was recorded maximum in soil solarization with TP for 30 days and was significant over soil solarization with TP for 15 days at 5 cm (42.5°C) and 10 cm (36.5°C) respectively.

During 25 days after spreading, soil temperature at 5 cm (52.8°C) and 10 cm (42.5°C) depth was recorded maximum in soil solarization with TP for 30 days and found significant over control at 5 cm (43°C) and 10 cm (37°C) respectively.

During 30 days after spreading, soil solarization with TP for 30 days at 5 cm (52.1°C) and 10 cm (47.6°C) depth was recorded maximum and was significant in soil solarization with TP for 15 days at 5 cm (44.1°C) and 10 cm (38.0°C).

4.2.6 Soil temperature in tobacco nursery

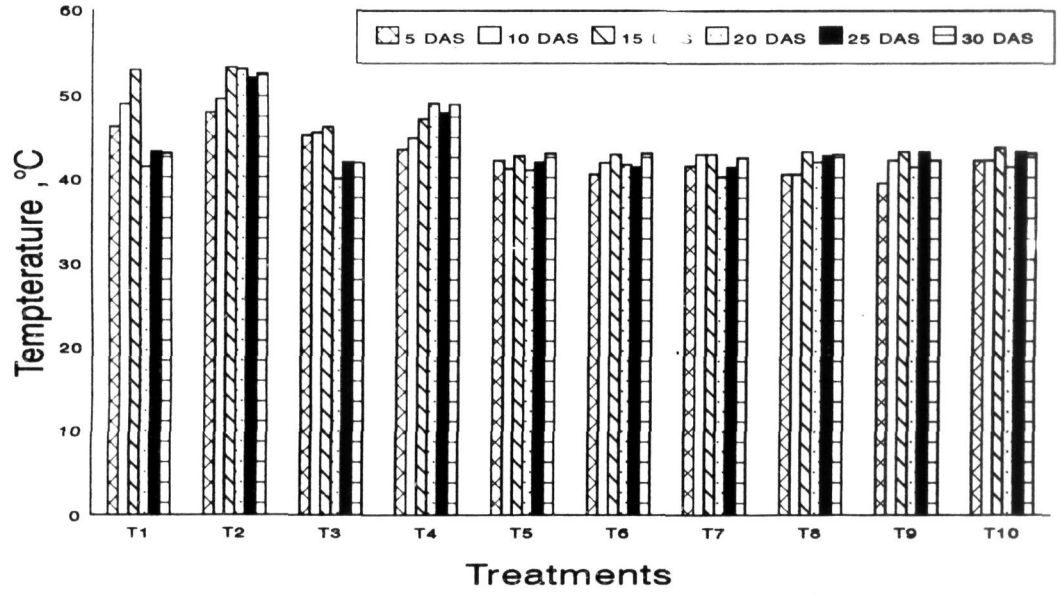
The data on variation in soil temperature at 5 and 10 cm depths are presented in Table 4.1f and Fig. 4.1f.

In tobacco, till 30 days after spreading the mulch, soil temperature at both 5 cm and 10 cm soil depth was found significant among the treatments.

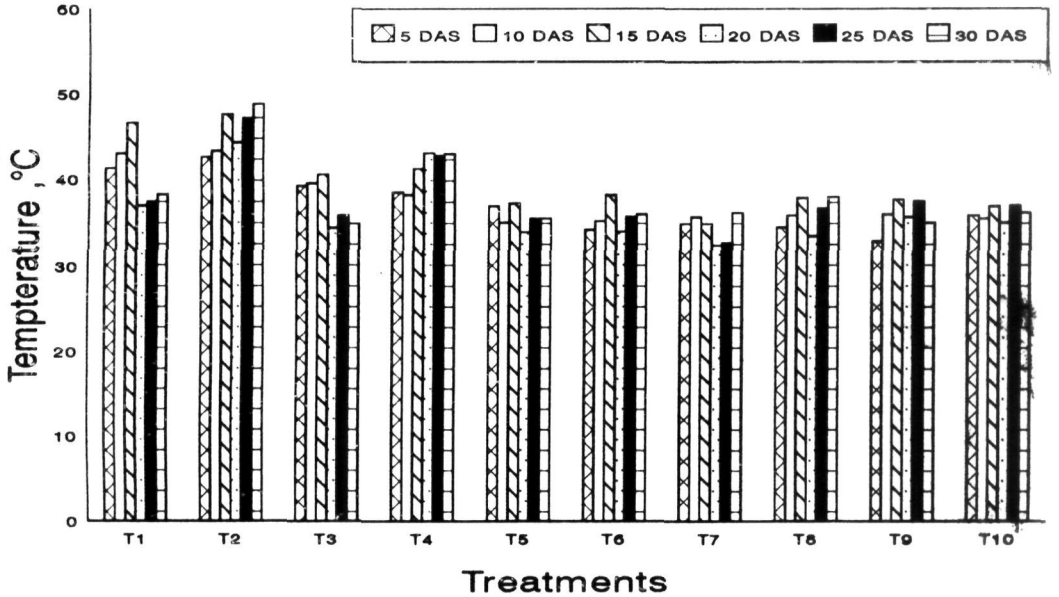
Table 4.1f Effect of weed control treatments on soil temperature (°C) at 5 cm and 10 cm depths during soil solarization period in tobacco nursery.

Treatments	Days after spreading											
	5		10		15		20		25		30	
	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm	5 cm	10 cm
T_1 : Soil solarization 15 days TP	46.3	41.3	49.0	43.0	53.0	46.6	41.5	37.0	43.3	37.5	43.1	38.3
T_2 : Soil solarization 30 days TP	48.0	42.6	49.6	43.3	53.3	47.6	53.1	44.3	52.1	47.1	52.6	48.8
T_3 : Soil solarization 15 days BP	45.3	39.3	45.6	39.6	46.3	40.6	40.1	34.5	42.1	36.0	42.0	35.0
T_4 : Soil solarization 30 days BP	43.6	38.6	45.0	38.3	47.3	41.3	49.1	43.1	48.0	42.8	49.0	43.0
T_5 : Mulching with coir pith at 5 t/ha	42.3	37.0	41.3	35.1	42.8	37.3	41.1	34.0	42.1	35.6	43.1	35.6
T_6 : Mulching with Pongamia leaves at 5 t/ha	40.6	34.3	42.0	35.3	43.0	38.3	41.8	34.1	41.5	35.8	43.1	36.1
T_7 : Mulchng with glyricidia leaves at 5 t/ha	41.6	35.0	43.0	35.8	43.0	35.0	40.3	32.5	41.5	32.8	42.6	36.3
T_8 : Pendimethalin 1 kg ai/ha	40.6	34.6	40.6	36.0	43.3	38.0	42.1	33.6	42.8	36.8	43.0	38.1
T_9 : Unweeded control	39.6	33.0	42.3	36.1	43.3	37.8	41.5	35.8	43.3	37.6	42.3	35.1
T_{10} : Hand weeding at 20 DAS	42.3	36.0	42.3	35.6	43.8	37.0	41.5	35.1	43.3	37.1	43.1	36.3
F test	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	1.25	1.30	1.24	1.67	1.11	0.90	0.70	1.61	0.74	0.69	0.88	0.69
C.D. at 0.05	2.63	2.73	2.70	3.50	2.34	1.89	1.47	3.37	1.55	1.43	1.84	1.44

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing



At 5 cm depth



At 10 cm depth

DAS: Days after spreading

Fig.4.1f: Effect of weed control treatments on soil temperature (°C) at 5 cm and 10 cm depths during soil solarization period in tobacco nursery.

During 5 days after spreading, soil temperature at 5 cm (48°C) and 10 cm (42.6°C) depth was recorded maximum in soil solarization with TP for 30 days and differed significantly over control at 5 cm (39.6°C) and 10 cm (33°C) respectively.

During 10 days after spreading, soil temperature at 5 cm (49.6°C) and 10 cm (43.3°C) depth in soil solarization with TP for 30 days was recorded maximum and followed by soil solarization with TP for 15 days at 5 cm (49°C) and 10 cm (43°C) depth.

During 15 days after spreading, maximum soil temperature was recorded in soil solarization with TP for 30 days at 5 cm (53.3°C) and 10 cm (47.6°C) depth and was significant with control at 5 cm (43.3°C) and 10 cm (37.8°C) depth. Mulching with coir pith, pongamia leaves and glyricidia leaves did not differ significantly with each other.

During 20 days after spreading, soil temperature at 5 cm (53.1°C) and 10cm (44.3°C) depth was recorded maximum in soil solarization with TP for 30 days and was significant in soil solarization with TP for 15 days at 5 cm (41.5°C) and 10 cm (37°C) respectively.

During 25 days after spreading, soil temperature at 5 cm (52.1°C) and 10 cm (47.1°C) depth was recorded maximum

with TP for 30 days and was significant with control at 5 cm (43.3°C) and 10 cm (37.6°C) depth respectively.

During 30 days after spreading, soil solarization with TP for 30 days at 5 cm (52.6°C) and 10 cm (48.8°C) depth was recorded maximum and differed significantly with soil solarization with TP for 15 days at 5 cm (43.1°C) and 10 cm (38.3°C) depth respectively. Mulching with coir pith, pongamia leaves and glyricidia leaves were found on par with each other.

4.3. Weed population

4.3.1 Weed population in finger millet nursery

The data on weed population at weekly intervals are presented in Table 4.2a.

The monocot, dicot, sedge and total weed population in finger millet nursery differed significantly among the treatments.

4.3.1.1 Monocot weed population

Transparent polyethylene mulch in general, recorded less monocot weed population over black polyethylene till 28 days after sowing (DAS). Mulching with coir pith, pongamia leaves and glyricidia leaves did not differ significantly over control. Hand weeding at 20 DAS had less weed

Table 4.2a Effect of weed control treatments on number of monocots, dicots, sedges and total number of weeds (0.25 m^2) at weekly intervals in finger millet nursery.

Treatments	Days after sowing													
	7			14			21				28			
	Mono-cots	Di-cots	Total No. of weeds	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds
T_1 : Soil solarization 15 days TP	1.95 (3.33)	1.64 (2.33)	2.46 (5.66)	2.19 (4.33)	1.76 (2.66)	2.72 (6.99)	4.10 (16.33)	2.48 (5.66)	2.33 (5.00)	5.24 (26.99)	4.33 (18.33)	2.79 (7.33)	2.48 (5.66)	5.31 (31.32)
T_2 : Soil solarization 30 days TP	1.67 (2.33)	1.29 (1.33)	2.01 (3.66)	1.86 (3.00)	1.44 (1.66)	2.25 (4.66)	3.93 (15.00)	2.16 (4.33)	1.95 (3.33)	4.80 (22.60)	4.13 (16.60)	2.33 (5.00)	2.11 (4.00)	5.11 (25.60)
T_3 : Soil solarization 15 days BP	2.61 (6.33)	2.11 (4.00)	3.23 (10.33)	3.02 (8.66)	2.46 (5.66)	3.83 (14.32)	4.48 (19.66)	3.48 (11.66)	2.91 (8.00)	6.31 (39.32)	4.84 (23.00)	3.23 (10.00)	3.07 (9.33)	6.53 (42.33)
T_4 : Soil solarization 30 days BP	2.47 (5.66)	1.93 (3.33)	3.06 (8.99)	2.79 (7.33)	2.25 (4.66)	3.52 (10.12)	4.33 (18.33)	3.23 (10.00)	2.67 (6.66)	5.95 (34.99)	4.52 (20.00)	3.18 (9.66)	2.97 (8.33)	6.20 (37.99)
T_5 : Mulching with coir pith at 5 t/ha	3.07 (7.00)	2.82 (4.33)	3.43 (11.33)	3.48 (10.66)	2.85 (7.66)	4.33 (18.32)	4.58 (20.66)	3.78 (13.33)	3.68 (9.33)	6.61 (43.32)	4.93 (24.00)	3.38 (11.33)	3.28 (10.33)	7.70 (45.60)
T_6 : Mulching with Pongamia leaves at 5 t/ha	3.09 (8.33)	2.91 (4.66)	3.66 (12.99)	3.51 (11.66)	2.96 (8.33)	4.52 (19.99)	4.69 (21.66)	3.84 (14.33)	3.71 (9.66)	6.79 (45.65)	5.03 (25.00)	3.43 (11.66)	3.38 (11.00)	7.91 (47.66)
T_7 : Mulchng with glyricidia leaves at 5 t/ha	3.08 (7.66)	2.95 (5.00)	3.62 (12.66)	3.53 (12.00)	2.75 (9.00)	4.43 (21.00)	4.84 (23.00)	3.93 (15.00)	3.75 (10.33)	6.98 (48.33)	5.16 (26.33)	3.65 (13.00)	3.43 (11.33)	7.93 (50.66)
T_8 : Pendimethalin 1 kg ai/ha	2.33 (5.00)	1.72 (3.00)	2.90 (8.00)	2.54 (6.00)	2.18 (4.33)	3.28 (10.33)	3.32 (10.66)	2.96 (8.33)	2.65 (6.66)	5.10 (25.65)	3.69 (13.33)	2.75 (9.00)	2.85 (7.66)	5.36 (29.99)
T_9 : Unweeded control	3.38 (11.66)	3.09 (9.33)	4.61 (20.99)	3.76 (15.00)	3.25 (13.00)	5.33 (28.00)	4.92 (26.00)	4.21 (18.33)	4.04 (16.00)	7.78 (60.33)	5.27 (30.60)	3.92 (20.66)	3.56 (20.66)	8.52 (70.92)
T_{10} : Hand weeding at 20 DAS	3.12 (8.66)	2.79 (7.33)	4.06 (15.99)	3.66 (13.00)	3.23 (10.00)	4.84 (23.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	3.47 (11.66)	2.96 (8.33)	2.66 (6.66)	5.21 (26.65)
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.06	0.28	0.16	0.09	0.19	0.13	0.15	0.15	0.17	0.18	0.11	0.18	0.14	0.24
C.D. at 0.05	0.31	0.83	0.49	0.29	0.57	0.40	0.41	0.46	0.53	0.54	0.34	0.54	0.42	0.73

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing
Figures in the parantheses indicate original values.

population on third and fourth week after sowing (WAS) (0.70 to 2.96/0.25 m^2).

4.3.1.2 Dicot weed population

Soil solarization with TP for 30 days recorded the least dicot weeds (1.29 to 2.11/0.25 m^2) followed by soil solarization with TP for 15 days (1.64 to 2.48/0.25 m^2) till 28 DAS. Pendimethalin at 1 kg a.i./ha had least dicot weeds (1.72 to 2.85/0.25 m^2) than soil solarization with BP for 30 days (1.93 to 2.97/0.25 m^2).

4.3.1.3 Sedge population

Hand weeding at 20 DAS recorded least sedge population (0.7 to 3.47/0.25 m^2) on third and fourth WAS followed by pendimethalin at 1 kg a.i./ha (3.32 to 3.69/0.25 m^2). Soil solarization for 30 days TP (3.93 to 4.13/0.25 m^2) recorded significantly less sedges than soil solarization for 30 days BP (4.33 to 4.52/0.25 m^2).

4.3.1.4 Total weed population

Soil solarization with TP for 30 days had less number of total weeds (2.01 to 5.11/0.25 m^2) which differed significantly over soil solarization for 30 days BP (3.06 to 6.2/0.25 m^2).

4.3.2 Weed population in paddy nursery

The data on weed population at weekly intervals are presented in Table 4.2b.

The monocot, dicot, sedge and total weed population in paddy nursery differed significantly among the treatments.

4.3.2.1 Monocot weed population

Soil solarization with TP for 30 days recorded least monocots (1.76 to 2.33/0.25 m^2) followed by soil solarization with 15 days TP (2.03 to 2.79/0.25 m^2). At third and fourth WAS, hand weeding at 20 DAS had significantly less monocot weeds (0.70 to 2.99/0.25 m^2) than the control (3.96 to 4.12/0.25 m^2).

4.3.2.2 Dicot weed population

Soil solarization with TP for 30 days recorded the least dicot weeds (1.55 to 2.11/0.25 m^2) till 28 DAS followed by soil solarization for 15 days TP (1.85 to 2.33/0.25 m^2). Pendimethalin at 1 kg a.i./ha (2.11 to 2.60/0.25 m^2) differed significantly with the control (3.00 to 4.21/0.25 m^2).

4.3.2.3 Sedge population

Hand weeding at 20 DAS recorded the least sedge population (0.7 to 3.23/0.25 m^2) on third and fourth WAS followed by pendimethalin at 1 kg a.i./ha (3.33 to 3.52/ 0.25 m^2).

Table 4.2b Effect of weed control treatments on number of monocots, dicots, sedges and total number of weeds (0.25 m^2) at weekly intervals in paddy nursery.

Treatments	Days after sowing													
	7			14			21				28			
	Monocots	Dicots	Total No. of weeds	Monocots	Dicots	Total No.of weeds	Sedges	Monocots	Dicots	Total No.of weeds	Sedges	Monocots	Dicots	Total No.of weeds
T_1 : Soil solarization 15 days TP	2.03 (3.66)	1.85 (3.00)	2.79 (6.66)	2.18 (4.33)	1.95 (3.33)	2.84 (7.66)	3.93 (15.00)	2.48 (5.66)	2.19 (4.33)	5.04 (24.99)	4.24 (17.66)	2.79 (7.33)	2.33 (5.00)	5.52 (29.00)
T_2 : Soil solarization 30 days TP	1.76 (2.66)	1.55 (2.00)	2.24 (4.66)	**1.93 (3.33)**	1.77 (2.66)	2.53 (5.99)	3.69 (13.33)	2.18 (2.33)	1.95 (3.33)	4.62 (20.99)	4.10 (16.33)	2.33 (5.00)	2.11 (4.00)	5.08 (25.33)
T_3 : Soil solarization 15 days BP	2.65 (6.66)	2.33 (5.00)	3.57 (11.66)	**3.13 (9.33)**	**2.79 (7.33)**	4.14 (16.66)	4.32 (18.33)	3.34 (10.66)	2.61 (6.33)	5.98 (35.32)	4.84 (23.00)	3.48 (11.66)	2.79 (7.33)	6.51 (41.99)
T_4 : Soil solarization 30 days BP	2.54 (6.00)	2.11 (4.00)	3.23 (10.00)	2.91 (8.00)	**2.54 (6.00)**	3.80 (14.00)	4.05 (16.00)	3.13 (9.33)	2.48 (5.66)	5.60 (30.99)	4.48 (19.66)	3.33 (10.66)	2.54 (6.00)	6.06 (36.32)
T_5 : Mulching with coir pith at 5 t/ha	2.85 (7.66)	2.69 (6.00)	3.78 (13.66)	3.49 (10.66)	3.13 (8.33)	4.66 (18.99)	4.75 (20.66)	3.57 (11.66)	3.47 (10.66)	6.83 (42.98)	4.92 (24.00)	3.72 (12.66)	3.80 (13.33)	7.28 (49.99)
T_6 : Mulching with Pongamia leaves at 5 t/ha	3.02 (8.66)	2.73 (6.33)	3.93 (14.99)	3.52 (12.00)	3.19 (9.33)	4.71 (21.33)	4.78 (21.66)	3.62 (12.66)	3.52 (12.00)	6.91 (46.32)	5.04 (25.00)	3.88 (14.00)	3.83 (15.00)	7.37 (54.00)
T_7 : Mulchng with glyricidia leaves at 5 t/ha	3.17 (9.66)	2.75 (6.66)	4.10 (16.32)	3.62 (12.66)	3.22 (10.00)	4.81 (22.66)	4.84 (23.00)	3.75 (13.66)	3.62 (12.66)	7.05 (49.32)	5.14 (26.00)	3.92 (15.00)	3.85 (14.00)	7.44 (55.00)
T_8 : Pendimethalin 1 kg ai/ha	2.89 (5.66)	2.11 (4.00)	3.18 (9.66)	2.67 (6.66)	2.33 (5.00)	3.48 (11.66)	3.33 (10.66)	2.85 (7.66)	2.48 (5.66)	4.98 (23.98)	3.52 (12.00)	3.07 (9.00)	2.60 (6.33)	5.21 (27.33)
T_9 : Unweeded control	3.37 (12.33)	3.00 (3.66)	4.20 (15.99)	3.80 (14.00)	3.51 (12.00)	4.89 (26.00)	5.03 (25.00)	3.96 (70.66)	3.74 (14.33)	7.10 (56.99)	5.29 (29.66)	4.12 (20.33)	4.21 (18.33)	7.54 (68.32)
T_{10} : Hand weeding at 20 DAS	3.29 (10.33)	2.79 (7.33)	4.26 (17.66)	3.57 (12.33)	3.23 (10.00)	4.77 (22.33)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	3.23 (10.00)	2.99 (8.33)	2.47 (5.66)	4.94 (23.99)
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.13	0.11	0.15	0.13	0.13	0.13	0.10	0.13	0.12	0.11	0.11	0.15	0.13	0.08
C.D. at 0.05	0.40	0.32	0.46	0.40	0.39	0.39	0.31	0.40	0.36	0.34	0.34	0.45	0.41	0.26

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing
Figures in the parantheses indicate original values.

4.3.2.4 Total weed population

Soil solarization with TP for 30 days had less number of total weeds (2.24 to 5.08/0.25 m^2) till 28 DAS and differed significantly with BP for 30 days (3.23 to 6.06/ 0.25 m^2). Mulching with coir pith, pongamia and glyricidia leaves did not differ significantly with control.

4.3.3 Weed population in chilli nursery

The data on weed population at weekly intervals are presented in Table 4.2c.

The monocot, dicot, sedge and total weed population in chilli nursery differed significantly among the treatments.

4.3.3.1 Monocot weed population

Soil solarization with TP for 30 days had least monocot weed population (1.55 to 2.31/0.25 m^2) compared to soil solarization with BP for 30 days (2.54 to 3.34/0.25 m^2). Mulching with coir pith, pongamia leaves and glyricidia leaves did not differ significantly with control.

4.3.3.2 Dicot weed population

Soil solarization with TP for 30 days had least dicot weed population (1.17 to 2.18/0.25 m^2) followed by soil solarization with TP for 15 days (1.55 to 2.48/0.25 m^2). Pendimethalin at 1 kg a.i./ha (1 95 to 2.96/0.25 m^2) differed significantly with control (3.07 to 4.29/0.25 m^2).

Table 4.2c Effect of weed control treatments on number of monocots, dicots, sedges and total number of weeds (0.25 m^2) at weekly intervals in chilli nursery.

Treatments	Days after sowing													
	7			14			21				28			
	Mono-cots	Di-cots	Total No. of weeds	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds
T_1 : Soil solarization 15 days TP	1.76 (2.66)	1.55 (2.00)	2.24 (4.66)	2.11 (4.00)	1.95 (3.33)	2.79 (7.33)	3.80 (14.00)	2.31 (5.00)	2.33 (5.00)	4.93 (24.00)	4.13 (16.66)	2.66 (6.66)	2.48 (5.66)	5.42 (28.98)
T_2 : Soil solarization 30 days TP	1.55 (1.66)	1.17 (3.00)	1.83 (4.06)	1.85 (3.00)	1.55 (2.00)	2.31 (5.00)	3.73 (13.00)	2.11 (4.00)	1.95 (3.33)	4.77 (20.33)	3.92 (15.00)	2.31 (5.00)	2.18 (4.33)	4.98 (24.33)
T_3 : Soil solarization 15 days BP	2.66 (6.66)	2.33 (5.00)	3.47 (11.66)	2.79 (7.33)	2.66 (6.66)	2.80 (12.99)	4.05 (16.00)	3.23 (10.00)	2.90 (8.00)	5.86 (34.00)	4.48 (19.66)	3.48 (11.66)	3.13 (9.33)	6.09 (40.65)
T_4 : Soil solarization 30 days BP	2.54 (6.00)	2.11 (4.00)	3.69 (10.00)	2.67 (6.66)	2.33 (5.00)	2.48 (12.66)	3.92 (15.00)	3.02 (9.33)	2.79 (7.33)	5.60 (31.66)	4.33 (18.33)	3.34 (10.66)	3.02 (8.66)	6.17 (37.65)
T_5 : Mulching with coir pith at 5 t/ha	2.80 (7.00)	2.83 (5.66)	3.75 (12.66)	3.22 (10.00)	3.13 (8.33)	4.33 (18.33)	4.29 (16.66)	3.62 (12.00)	3.52 (9.33)	6.74 (37.99)	4.81 (20.66)	4.05 (13.00)	3.91 (10.66)	6.90 (44.32)
T_6 : Mulching with Pongamia leaves at 5 t/ha	2.85 (7.66)	2.91 (6.33)	3.80 (13.99)	3.43 (11.33)	3.21 (8.66)	4.52 (19.99)	4.31 (18.00)	3.70 (12.66)	3.61 (10.33)	6.89 (40.99)	4.92 (22.33)	4.12 (13.66)	3.95 (12.00)	6.96 (47.99)
T_7 : Mulchng with glyricidia leaves at 5 t/ha	2.97 (8.33)	2.95 (6.66)	3.93 (14.99)	3.52 (12.00)	3.25 (9.33)	4.66 (21.33)	4.37 (18.66)	3.76 (13.66)	3.69 (11.33)	6.98 (43.65)	4.95 (22.66)	4.15 (16.00)	4.01 (13.00)	7.20 (51.66)
T_8 : Pendimethalin 1 kg ai/ha	2.31 (5.00)	1.95 (3.33)	2.95 (8.33)	2.54 (6.00)	2.24 (4.66)	3.32 (10.66)	3.23 (10.00)	2.97 (8.33)	2.85 (7.66)	5.14 (25.99)	3.48 (11.66)	3.13 (9.33)	2.96 (8.33)	5.46 (29.32)
T_9 : Unweeded control	3.22 (10.00)	3.07 (9.00)	4.04 (19.00)	3.62 (13.33)	3.48 (11.66)	5.04 (24.99)	4.59 (20.66)	3.97 (16.66)	3.96 (15.33)	7.27 (52.65)	5.17 (26.33)	4.34 (19.33)	4.29 (18.00)	7.25 (63.66)
T_{10} : Hand weeding at 20 DAS	3.02 (8.66)	2.89 (7.66)	4.00 (16.32)	3.61 (12.66)	3.22 (10.00)	4.81 (22.66)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	3.23 (10.00)	2.97 (8.33)	2.60 (16.33)	5.01 (24.66)
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.16	0.14	0.20	0.14	0.16	0.16	0.12	0.12	0.19	0.15	0.12	0.12	0.14	0.13
C.D. at 0.05	0.48	0.42	0.61	0.42	0.48	0.47	0.38	0.38	0.56	0.46	0.35	0.38	0.42	0.39

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing
Figures in the parantheses indicate original values.

4.3.3.3 Sedge population

Hand weeding at 20 DAS had least sedge population (0.7 to 3.23/0.25 m^2) followed by pendimethalin at 1 kg a.i./ha (3.23 to 3.48/0.25 m^2).

4.3.3.4 Total weed population

Soil solarization with TP for 30 days recorded least total weed population (1.83 to 4.98/0.25 m^2) and differed significantly with soil solarization with BP for 30 days (3.69 to 6.17/0.25 m^2). Pendimethalin at 1 kg a.i./ha (2.95 to 5.46/0.25 m^2) differed significantly over control (4.04 to 7.25/0.25 m^2).

4.3.4 Weed population in tomato nursery

The observations on weed population at weekly intervals are presented in Table 4.2d.

The monocot, dicot, sedge and total weed population in tomato nursery differed significantly among the treatments.

4.3.4.1 Monocot weed population

Soil solarization with TP for 30 days recorded least monocot weed population (1.76 to 2.52/0.25 m^2) and differed significantly in soil solarization with BP for 30 days (2.54 to 3.33/0.25 m^2) till 28 DAS. Pendimethalin at 1 kg a.i./ha

Table 4.2d Effect of weed control treatments on number of monocots, dicots, sedges and total number of weeds (0.25 m^2) at weekly intervals in tomato nursery.

Treatments	Days after sowing													
	7			14			21				28			
	Mono-cots	Di-cots	Total No. of weeds	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds
T_1 : Soil solarization 15 days TP	1.93 (3.33)	1.76 (2.66)	2.51 (5.99)	2.41 (5.33)	1.95 (3.33)	3.02 (8.66)	3.92 (15.00)	2.54 (6.00)	2.08 (4.00)	5.04 (25.00)	4.48 (19.66)	2.79 (7.33)	2.33 (5.00)	5.95 (34.66)
T_2 : Soil solarization 30 days TP	1.76 (2.66)	1.38 (1.66)	2.14 (4.32)	2.11 (4.00)	1.64 (2.33)	2.59 (6.33)	3.83 (14.33)	2.33 (5.00)	1.93 (3.33)	4.80 (22.66)	4.70 (21.66)	2.52 (6.00)	2.09 (4.00)	5.74 (32.66)
T_3 : Soil solarization 15 days BP	2.66 (6.66)	2.27 (4.66)	3.43 (11.32)	3.12 (9.33)	2.52 (6.00)	3.96 (15.33)	4.44 (19.33)	3.38 (10.66)	2.44 (5.66)	6.01 (35.65)	4.87 (23.33)	3.47 (11.66)	2.86 (7.66)	6.42 (40.98)
T_4 : Soil solarization 30 days BP	2.54 (6.00)	2.11 (4.00)	3.24 (10.00)	2.91 (8.00)	2.33 (5.00)	3.66 (12.00)	4.05 (16.00)	3.12 (9.33)	2.26 (4.66)	5.85 (29.99)	4.79 (22.66)	3.33 (10.66)	2.84 (6.66)	6.12 (36.98)
T_5 : Mulching with coir pith at 5 t/ha	3.02 (7.33)	2.81 (5.00)	3.98 (12.33)	3.43 (10.66)	2.89 (7.33)	4.89 (17.33)	4.77 (20.00)	3.93 (13.00)	3.51 (7.00)	7.26 (40.00)	5.03 (24.33)	4.07 (15.00)	3.79 (10.66)	7.90 (49.99)
T_6 : Mulching with Pongamia leaves at 5 t/ha	3.14 (8.33)	2.90 (5.33)	4.04 (13.66)	3.44 (10.33)	2.90 (8.00)	4.91 (17.99)	4.81 (21.00)	3.97 (13.33)	3.61 (8.33)	7.31 (42.66)	5.13 (25.00)	4.14 (16.00)	3.81 (13.00)	7.95 (54.00)
T_7 : Mulchng with glyricidia leaves at 5 t/ha	3.15 (8.66)	2.92 (5.66)	4.10 (14.32)	3.57 (12.33)	3.07 (9.00)	4.98 (21.33)	4.85 (22.30)	4.06 (14.00)	3.68 (12.00)	7.35 (48.33)	5.14 (26.00)	4.19 (17.00)	3.89 (13.66)	7.98 (56.66)
T_8 : Pendimethalin 1 kg ai/ha	2.33 (5.00)	1.95 (3.33)	2.96 (8.33)	2.79 (7.33)	2.25 (4.66)	3.53 (11.99)	3.12 (9.33)	2.91 (8.00)	2.33 (5.00)	4.77 (22.33)	3.48 (11.66)	3.07 (9.00)	2.66 (6.66)	5.27 (27.32)
T_9 : Unweeded control	3.33 (10.66)	3.13 (9.33)	4.52 (19.99)	3.67 (13.00)	3.42 (12.00)	5.14 (26.00)	5.03 (25.00)	4.22 (17.33)	3.92 (15.00)	7.60 (57.33)	5.36 (28.33)	4.59 (20.66)	4.43 (19.33)	8.28 (68.32)
T_{10} : Hand weeding at 20 DAS	3.12 (9.33)	2.73 (7.00)	4.10 (16.33)	3.93 (14.00)	3.17 (9.66)	5.01 (22.66)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	3.23 (10.00)	2.90 (8.00)	2.44 (5.66)	5.04 (23.66)
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.14	0.14	0.16	0.10	0.19	0.13	0.11	0.10	0.20	0.13	0.12	0.18	0.22	0.17
C.D. at 0.05	0.43	0.41	0.48	0.30	0.57	0.39	0.35	0.31	0.11	0.40	0.37	0.53	0.67	0.50

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing
Figures in the parantheses indicate original values.

(2.33 to 3.07/0.25 m^2) differed significantly with the control (3.33 to 4.43/0.25 m^2).

4.3.4.2 Dicot weed population

Soil solarization with TP for 30 days had least dicot weeds (1.38 to 2.09/0.25 m^2) followed by soil solarization with TP for 15 days (1.76 to 2.33/0.25 m^2) till 28 DAS. Mulching with coir pith, pongamia and glyricidia leaves did not differ significantly with the control.

4.3.4.3 Sedge population

Hand weeding at 20 DAS recorded least sedge population (0.7 to 3.23/0.25 m^2) on third and fourth WAS followed by pendimethalin at 1 kg a.i./ha (3.12 to 3.48/0.25 m^2).

4.3.4.4 Total weed population

Soil solarization with TP for 30 days had least total weed population (2.14 to 5.74/0.25 m^2) and differed significantly with the control (4.52 to 8.28/0.25 m^2). Pendimethalin at 1 kg a.i./ha recorded less total weed population (2.96 to 5.27/0.25 m^2) compared to soil solarization with BP for 30 days (3.24 to 6.12/0.25 m^2) till 28 DAS.

4.3.5 Weed population in capsicum nursery

The observations on weed population at weekly intervals are presented in Table 4.2e.

Table 4.2e Effect of weed control treatments on number of monocots, dicots, sedges and total number of weeds (0.25 m^2) at weekly intervals in capsicum nursery.

Treatments	Days after sowing													
	7			14			21				28			
	Monocots	Dicots	Total No. of weeds	Monocots	Dicots	Total No.of weeds	Sedges	Monocots	Dicots	Total No.of weeds	Sedges	Monocots	Dicots	Total No.of weeds
T_1 : Soil solarization 15 days TP	1.64 (2.33)	1.64 (2.33)	2.20 (4.66)	1.85 (3.00)	1.95 (3.33)	2.60 (6.33)	4.13 (16.66)	2.33 (5.00)	2.19 (4.33)	5.14 (25.99)	4.52 (20.00)	2.53 (6.00)	2.33 (5.00)	5.60 (31.00)
T_2 : Soil solarization 30 days TP	1.38 (1.66)	1.28 (1.33)	1.72 (2.99)	1.64 (2.33)	1.55 (2.00)	2.15 (4.33)	4.00 (15.66)	1.95 (3.33)	1.93 (3.33)	4.77 (22.32)	4.33 (18.33)	2.11 (4.00)	2.12 (4.00)	5.17 (26.33)
T_3 : Soil solarization 15 days BP	2.44 (5.66)	2.24 (4.66)	3.26 (11.32)	2.73 (7.00)	2.46 (5.66)	3.62 (12.66)	4.41 (19.00)	3.13 (9.33)	2.67 (6.66)	5.95 (34.99)	4.70 (21.66)	3.29 (10.33)	3.02 (8.66)	6.41 (40.65)
T_4 : Soil solarization 30 days BP	2.33 (5.00)	2.11 (4.00)	3.07 (9.00)	2.53 (6.00)	2.25 (4.66)	3.31 (10.66)	4.29 (18.00)	2.91 (6.00)	2.47 (5.66)	5.67 (29.66)	4.63 (21.00)	3.13 (9.33)	2.61 (6.33)	6.09 (36.66)
T_5 : Mulching with coir pith at 5 t/ha	2.59 (6.33)	2.38 (5.33)	3.75 (11.66)	2.85 (7.66)	2.79 (6.66)	4.79 (14.32)	4.52 (20.00)	3.52 (9.66)	3.29 (9.66)	6.98 (39.32)	5.20 (26.33)	3.82 (10.66)	3.70 (12.00)	7.89 (48.99)
T_6 : Mulching with Pongamia leaves at 5 t/ha	2.97 (8.33)	2.46 (5.66)	3.79 (13.99)	2.97 (8.33)	2.90 (8.00)	4.91 (16.33)	4.66 (21.33)	3.61 (10.66)	3.32 (10.66)	7.02 (42.65)	5.25 (26.66)	3.87 (13.00)	3.81 (13.33)	7.90 (52.99)
T_7 : Mulchng with glyricidia leaves at 5 t/ha	3.02 (8.66)	2.54 (6.00)	3.89 (14.66)	3.13 (9.33)	3.02 (8.66)	4.89 (17.99)	4.70 (21.66)	3.65 (12.00)	3.51 (12.00)	7.13 (45.66)	5.30 (27.66)	3.93 (15.00)	3.92 (15.00)	7.93 (57.66)
T_8 : Pendimethalin 1 kg ai/ha	2.11 (4.00)	1.93 (3.33)	2.78 (7.33)	2.33 (5.00)	2.11 (4.00)	3.07 (9.00)	3.07 (9.00)	2.67 (6.66)	2.46 (5.66)	4.77 (21.32)	3.38 (11.00)	2.97 (8.33)	2.52 (6.00)	5.07 (25.33)
T_9 : Unweeded control	3.13 (10.00)	2.61 (7.33)	4.22 (17.33)	3.16 (13.66)	3.32 (11.33)	5.04 (24.99)	4.92 (25.00)	3.92 (16.00)	3.84 (14.33)	7.46 (55.33)	5.52 (30.00)	4.17 (17.00)	4.02 (18.66)	8.13 (65.66)
T_{10} : Hand weeding at 20 DAS	3.07 (9.00)	2.67 (6.66)	4.02 (15.66)	3.57 (12.33)	3.16 (9.66)	4.52 (21.99)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	3.23 (10.00)	2.73 (7.00)	2.46 (5.66)	4.81 (22.66)
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.19	0.12	0.19	0.18	0.19	0.15	0.14	0.14	0.20	0.12	0.08	0.12	0.17	0.11
C.D. at 0.05	0.57	0.37	0.58	0.32	0.58	0.45	0.42	0.43	0.62	0.38	0.25	0.36	0.52	0.33

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing
Figures in the parantheses indicate original values.

The monocot, dicot, sedge and total weed population in capsicum nursery differed significantly among the treatments.

4.3.5.1 Monocot weed population

Soil solarization with TP for 30 days recorded least monocot weed population (1.38 to 2.11/0.25 m^2) and it differed significantly from soil solarization with BP for 30 days (2.33 to 3.13/0.25 m^2) till 28 DAS. Pendimethalin at 1 kg a.i./ha (2.11 to 2.97/0.25 m^2) differed significantly with the control (3.13 to 4.17/0.25 m^2).

4.3.5.2 Dicot weed population

Soil solarization with TP for 30 days recorded least dicot weeds (1.28 to 2.12/0.25 m^2) followed by soil solarization with TP for 15 days (1.64 to 2.33/0.25 m^2) till 28 DAS. Mulching with coir pith, pongamia and glyricidia leaves were found on par with the control.

4.3.5.3 Sedge population

Hand weeding at 20 DAS recorded least sedges (0.7 to 3.23/0.25 m^2) followed by pendimethalin at 1 kg a.i./ha (3.07 to 3.38/0.25 m^2) on third and fourth WAS. Soil solarization with BP for 30 days (4.29 to 4.63/0.25 m^2) recorded more sedges and did not differ significantly with soil solarization with TP for 30 days (4.0 to 4.33/0.25 m^2).

4.3.5.4 Total weed population

Soil solarization with TP for 30 days recorded least total weed population (1.72 to 5.17/0.25 m^2) and differed significantly with soil solarization with BP for 30 days (3.07 to 6.09/0.25 m^2). Pendimethalin at 1 kg a.i./ha (2.78 to 5.07/0.25 m^2) differed significantly with the control (4.22 to 8.13/0.25 m^2).

4.3.6 Weed population in tobacco nursery

The data on weed population at weekly intervals are presented in Table 4.2f.

The monocot, dicot, sedge and total weed population in tobacco nursery differed significantly among the treatments.

4.3.6.1 Monocot weed population

Soil solarization with TP for 30 days had least monocot weed population (1.34 to 2.61/0.25 m^2) and differed significantly in soil solarization with BP for 30 days (2.33 to 3.71/0.25 m^2). Pendimethalin at 1 kg a.i./ha (2.11 to 3.58/0.25 m^2) differed significantly with the control (3.04 to 4.81/0.25 m^2).

4.3.6.2 Dicot weed population

Soil solarization with TP for 30 days had least dicot weed population (0.33 to 2.61/0.25 m^2) followed by soil

Table 4.2f Effect of weed control treatments on number of monocots, dicots, sedges and total number of weeds (0.25 m^2) at weekly intervals in tobacco nursery.

Treatments	Days after sowing																					
	7			14			21				28				35				42			
	Mono-cots	Di-cots	Total No. of weeds	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds
T_1 : Soil solarization 15 days TP	1.76 (2.66)	0.44 (1.66)	2.38 (5.66)	2.19 (4.33)	1.94 (3.33)	2.85 (7.66)	4.21 (17.33)	2.48 (5.66)	2.25 (4.66)	5.30 (27.65)	4.41 (19.00)	2.67 (6.66)	2.33 (5.00)	5.58 (30.66)	4.56 (20.30)	2.85 (7.66)	2.48 (5.66)	5.84 (33.66)	4.70 (21.66)	3.02 (8.66)	2.79 (7.33)	6.17 (37.66)
T_2 : Soil solarization 30 days TP	1.34 (1.33)	0.33 (0.66)	1.83 (2.99)	1.64 (2.33)	1.55 (2.00)	2.14 (4.33)	4.10 (16.33)	2.11 (4.00)	1.94 (3.33)	4.91 (23.66)	4.26 (17.66)	2.33 (5.00)	2.11 (4.00)	5.21 (26.66)	4.33 (18.30)	2.54 (6.00)	2.33 (5.00)	5.45 (29.30)	4.40 (19.00)	2.85 (7.66)	2.61 (6.33)	5.78 (32.99)
T_3 : Soil solarization 15 days BP	2.54 (6.00)	2.18 (4.33)	3.28 (10.33)	2.90 (8.00)	2.61 (6.33)	3.84 (14.33)	4.33 (18.33)	3.28 (10.33)	2.91 (8.00)	6.09 (36.66)	4.63 (21.00)	3.47 (11.66)	3.13 (9.33)	6.51 (41.99)	5.17 (26.33)	3.67 (13.00)	3.34 (10.66)	7.10 (49.99)	5.36 (28.33)	3.85 (14.33)	3.53 (12.00)	7.42 (54.66)
T_4 : Soil solarization 30 days BP	2.33 (5.00)	2.11 (4.00)	3.07 (9.00)	2.67 (6.66)	2.48 (5.66)	3.58 (12.32)	2.30 (18.00)	3.12 (9.33)	2.79 (7.33)	5.92 (34.66)	4.52 (20.00)	3.38 (10.66)	2.91 (8.00)	6.25 (38.66)	4.70 (21.66)	3.53 (12.00)	2.97 (3.33)	6.51 (41.99)	4.81 (22.66)	3.71 (13.33)	3.18 (9.66)	6.79 (45.65)
T_5 : Mulching with coir pith at 5 t/ha	2.69 (6.33)	2.63 (5.00)	3.91 (11.33)	3.40 (9.66)	2.97 (8.33)	4.52 (17.99)	4.59 (19.00)	3.67 (13.00)	3.49 (9.00)	7.09 (41.00)	5.17 (23.33)	3.96 (13.00)	3.83 (10.33)	7.90 (46.66)	5.75 (27.33)	4.38 (14.33)	4.31 (11.66)	7.67 (53.32)	6.20 (29.33)	4.63 (16.00)	4.54 (13.00)	7.99 (58.33)
T_6 : Mulching with Pongamia leaves at 5 t/ha	2.79 (7.33)	2.98 (5.66)	4.04 (12.99)	3.45 (10.66)	3.12 (9.33)	4.61 (19.66)	4.63 (20.00)	3.71 (13.33)	3.51 (9.66)	7.20 (42.99)	5.21 (25.00)	4.06 (15.00)	3.95 (12.00)	7.95 (52.00)	5.81 (28.33)	4.39 (16.66)	4.35 (13.33)	7.84 (19.44)	6.85 (30.66)	4.71 (17.66)	4.61 (15.00)	8.03 (63.32)
T_7 : Mulchng with glyricidia leaves at 5 t/ha	2.84 (7.66)	2.81 (4.33)	4.13 (11.99)	3.50 (11.66)	3.23 (10.00)	4.73 (21.66)	4.69 (20.66)	3.93 (15.00)	3.53 (11.66)	7.31 (47.32)	5.35 (26.33)	4.04 (16.00)	4.01 (13.33)	8.01 (55.66)	5.89 (29.66)	4.49 (16.99)	4.40 (15.00)	7.85 (61.65)	6.31 (32.00)	4.83 (18.00)	4.69 (16.66)	8.05 (66.66)
T_8 : Pendimethalin 1 kg ai/ha	2.11 (4.00)	1.94 (3.33)	2.79 (7.33)	2.47 (5.66)	2.33 (5.00)	3.33 (10.66)	3.48 (11.66)	2.96 (8.33)	2.66 (6.66)	5.21 (26.65)	3.57 (12.33)	3.12 (9.33)	2.79 (7.33)	5.42 (28.99)	4.05 (16.00)	3.29 (10.33)	2.97 (8.33)	5.92 (34.66)	4.37 (18.66)	3.58 (12.33)	3.23 (10.00)	6.44 (40.99)
T_9 : Unweeded control	3.04 (10.66)	3.02 (8.66)	4.45 (19.32)	3.80 (14.00)	3.37 (11.66)	5.11 (25.66)	4.81 (22.66)	4.11 (16.66)	3.97 (15.33)	7.41 (54.65)	5.45 (29.33)	4.45 (19.33)	4.25 (17.66)	8.20 (66.32)	5.98 (35.33)	4.63 (21.00)	4.52 (20.00)	8.15 (76.33)	6.36 (40.00)	4.81 (22.66)	4.72 (21.66)	9.21 (84.32)
T_{10} : Hand weeding at 20 DAS	2.96 (8.33)	2.79 (7.33)	4.00 (15.66)	3.61 (12.66)	3.33 (10.66)	4.87 (23.66)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	3.29 (10.33)	2.96 (8.33)	2.48 (5.66)	4.98 (24.32)	4.05 (16.00)	3.23 (10.00)	2.79 (7.33)	5.81 (33.33)	4.14 (16.66)	3.48 (11.66)	2.97 (8.33)	6.09 (36.66)
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.12	0.14	0.15	0.13	0.14	0.21	0.06	0.16	0.13	0.10	0.09	0.14	0.12	0.14	0.08	0.08	0.07	0.16	0.05	0.06	0.06	0.07
C.D. at 0.05	0.36	0.44	0.47	0.40	0.42	0.63	0.20	0.49	0.40	0.32	0.28	0.42	0.37	0.42	0.24	0.25	0.22	0.49	0.17	0.20	0.18	0.22

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing; Figures in the parantheses indicate original values.

solarization with TP for 15 days (0.44 to 2.79/0.25 m^2). Mulching with coir pith, pongamia and glyricidia leaves were found on par with the control.

4.3.6.3 Sedge population

Hand weeding at 20 DAS had least sedges (0.7 to 4.14/0.25 m^2) and differed significantly in soil solarization with TP for 30 days (4.10 to 4.4/0.25 m^2) at third to sixth WAS. Pendimethalin at 1 kg a.i./ha (3.48 to 4.37/0.25 m^2) differed significantly with the control (4.81 to 6.36/ 0.25 m^2).

4.3.6.4 Total weed population

Soil solarization with BP for 30 days had more total weed population (3.07 to 6.79/0.25 m^2) than soil solarization with TP for 30 days (1.83 to 5.78/0.25 m^2). Mulching with coir pith, pongamia and glyricidia leaves did not differ significantly with the control.

4.4 Dry matter production of weeds

4.4.1 Dry matter production of weeds in finger millet nursery

The data on dry matter production of weeds at weekly intervals are presented in Table 4.3a and Fig. 4.2a.

Dry weight of monocot, dicot, sedge and total weed population differed significantly due to weed control treatments at weekly intervals among the treatments.

Table 4.3a Effect of weed control treatments on dry matter production (g/0.25m²) and its distribution at weekly intervals in finger millet nursery

Treatments	Days after sowing													
	7			14			21				28			
	Mono-cots	Di-cots	Total No. of weeds	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds
T_1 : Soil solarization 15 days TP	1.22 (1.00)	1.09 (0.73)	1.48 (1.73)	1.37 (1.40)	1.16 (0.86)	1.65 (2.26)	2.96 (7.96)	1.66 (2.26)	1.51 (1.83)	1.14 (12.05)	3.02 (8.63)	1.94 (3.33)	1.66 (2.26)	3.83 (14.22)
T_2 : Soil solarization 30 days TP	1.02 (0.76)	0.96 (0.46)	1.30 (1.22)	1.19 (0.93)	0.09 (0.50)	1.38 (1.43)	2.80 (7.40)	1.41 (1.60)	1.22 (1.00)	1.07 (10.00)	2.92 (8.06)	1.51 (1.83)	1.33 (1.30)	3.42 (11.19)
T_3 : Soil solarization 15 days BP	1.77 (2.66)	1.33 (1.30)	2.19 (3.96)	2.16 (4.20)	1.63 (2.26)	2.62 (6.46)	3.08 (9.03)	2.54 (5.96)	2.06 (3.76)	1.29 (18.75)	3.30 (10.43)	2.35 (5.06)	2.25 (4.60)	4.53 (20.09)
T_4 : Soil solarization 30 days BP	1.63 (2.20)	1.26 (1.13)	1.94 (3.33)	1.93 (3.26)	1.47 (1.73)	2.33 (5.40)	3.02 (8.63)	2.35 (5.06)	1.82 (2.83)	1.26 (16.52)	3.10 (9.16)	2.30 (4.83)	2.12 (4.03)	4.30 (18.02)
T_5 : Mulching with coir pith at 5 t/ha	2.12 (3.10)	1.87 (1.53)	2.98 (4.63)	2.61 (6.81)	2.02 (3.53)	3.59 (10.34)	3.26 (9.53)	2.71 (7.20)	2.46 (6.30)	1.35 (23.03)	3.59 (12.90)	2.81 (8.90)	2.75 (8.90)	5.08 (30.70)
T_6 : Mulching with Pongamia leaves at 5 t/ha	2.18 (4.03)	1.92 (1.73)	3.02 (5.76)	2.79 (6.89)	2.13 (3.93)	3.68 (10.82)	3.31 (10.90)	2.77 (7.50)	2.59 (6.90)	1.37 (25.30)	3.63 (13.50)	2.95 (9.09)	2.79 (9.01)	5.15 (31.59)
T_7 : Mulchng with glyricidia leaves at 5 t/ha	2.15 (3.53)	1.93 (1.83)	3.04 (5.36)	2.81 (6.93)	2.20 (3.33)	3.69 (10.26)	3.37 (11.30)	2.80 (7.90)	2.61 (7.02)	1.39 (26.22)	3.64 (13.90)	2.99 (9.13)	2.89 (9.09)	5.19 (32.12)
T_8 : Pendimethalin 1 kg ai/ha	1.51 (1.83)	1.17 (1.00)	1.81 (2.83)	1.70 (2.43)	1.40 (1.53)	2.10 (3.96)	2.39 (5.33)	2.09 (3.93)	1.81 (2.93)	1.15 (12.19)	2.64 (6.56)	1.90 (3.39)	2.00 (3.53)	3.73 (13.48)
T_9 : Unweeded control	2.24 (5.96)	2.19 (4.50)	3.29 (10.46)	2.85 (7.40)	2.62 (6.46)	3.78 (13.86)	3.52 (12.00)	3.01 (8.60)	2.86 (7.73)	1.48 (28.33)	3.83 (14.20)	3.16 (9.53)	3.10 (9.20)	5.28 (32.93)
T_{10} : Hand weeding at 20 DAS	2.16 (4.89)	1.93 (3.26)	2.82 (8.15)	2.79 (6.89)	2.42 (5.96)	3.63 (12.85)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	2.51 (5.90)	2.09 (3.93)	1.82 (2.86)	3.63 (12.69)
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.05	0.17	0.11	0.06	0.15	0.10	0.10	0.10	0.14	0.02	0.08	0.15	0.10	0.11
C.D. at 0.05	0.15	0.52	0.32	0.18	0.46	0.32	0.32	0.30	0.43	0.08	0.25	0.45	0.31	0.33

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing; Figures in the parantheses indicate original values.

4.4.1.1 Dry matter production of monocot weeds

Soil solarization with BP for 15 days and 30 days recorded more dry matter production (1.77 to 2.35 g/0.25 m^2 and 1.63 to 2.30 g/0.25 m^2) respectively than soil solarization with TP for 15 days (1.22 to 1.94 g/0.25 m^2) and 30 days (1.02 to 1.51 g/0.25 m^2) till 28 DAS. Hand weeding at 20 DAS recorded less dry matter production of monocots on third and fourth WAS than with the control.

4.4.1.2 Dry matter production of dicot weeds

Soil solarization with TP for 30 days (0.96 to 1.33 g/0.25 m^2) had least dry matter production of dicots followed by soil solarization with TP for 15 days (1.09 to 1.66 g/0.25 m^2). Hand weeding at 20 DAS had less dry weight of dicot weeds (0.70 to 1.82 g/0.25 m^2) than soil solarization with BP for 30 days (1.82 to 2.12 g/0.25 m^2) on third and fourth WAS. Mulching with coir pith, pongamia and glyricidia leaves did not differ significantly with the control.

4.4.1.3 Dry matter production of sedges

Hand weeding at 20 DAS had least dry matter production of sedges (0.70 to 2.51 g/0.25 m^2) followed by pendimethalin at 1 kg a.i./ha (2.39 to 2.64 g/0.25 m^2) at third and fourth WAS. Soil solarization with TP for 15 days (2.96 to 3.02 g/0.25 m^2) was found on par with soil solarization with TP for 30 days (2.8 to 2.92 g/0.25 m^2).

4.4.1.4 Dry matter production of total weeds

Soil solarization with TP for 30 days recorded least dry matter production of total weeds (1.30 to 3.42 g/0.25 m^2) and differed significantly in soil solarization with BP for 30 days (1.94 to 4.30 g/0.25 m^2). Mulching with coir pith, pongamia and glyricidia leaves were found on par with the control.

4.4.2 Dry matter production of weeds in paddy nursery

The observations recorded on dry matter production of weeds at weekly intervals are presented in Table 4.3b and Fig.4.2a.

Dry weight of monocots, dicots, sedges and total weeds population differed significantly due to weed control treatments at weekly intervals among the treatments.

4.4.2.1 Dry matter production of monocot weeds

Soil solarization with TP for 30 days recorded least dry matter production of monocots (1.16 to 1.94 g/0.25 m^2) compared to control (2.29 to 2.85 g/0.25 m^2). Soil solarization with BP for 15 days (1.82 to 2.54 g/0.25 m^2) was found on par with soil solarization for 30 days BP (1.70 to 2.41 g/0.25 m^2).

4.4.2.2 Dry matter production of dicot weeds

Soil solarization with BP for 30 days recorded more dry matter production of dicots (1.33 to 1.77 g/0.25 m^2) than

Table 4.3b Effect of weed control treatments on dry matter production (g/0.25m²) and its distribution at weekly intervals in paddy nursery.

Treatments	Days after sowing													
	7			14			21				28			
	Monocots	Dicots	Total No. of weeds	Monocots	Dicots	Total No.of weeds	Sedges	Monocots	Dicots	Total No.of weeds	Sedges	Monocots	Dicots	Total No.of weeds
T_1 : Soil solarization 15 days TP	1.26 (1.00)	1.19 (0.93)	1.59 (1.93)	1.40 (1.53)	1.22 (1.00)	1.73 (2.53)	2.80 (7.40)	1.40 (2.26)	1.22 (1.40)	3.39 (11.06)	2.97 (8.40)	1.51 (3.33)	1.49 (1.83)	3.75 (13.56)
T_2 : Soil solarization 30 days TP	1.16 (0.86)	1.05 (0.70)	1.38 (2.76)	1.26 (1.13)	1.15 (0.90)	1.56 (2.03)	2.64 (6.56)	1.66 (1.53)	1.37 (1.00)	3.08 (9.09)	2.90 (7.96)	1.94 (1.83)	1.33 (1.30)	3.40 (11.09)
T_3 : Soil solarization 15 days BP	1.82 (2.93)	1.51 (1.83)	2.27 (4.76)	2.27 (4.66)	1.95 (3.36)	2.91 (8.02)	3.01 (8.60)	2.72 (5.46)	1.77 (2.66)	4.14 (16.72)	3.30 (10.43)	2.54 (5.96)	1.93 (3.26)	4.48 (19.65)
T_4 : Soil solarization 30 days BP	1.70 (2.43)	1.33 (1.30)	2.04 (3.73)	2.06 (3.76)	1.70 (2.43)	2.58 (6.19)	2.86 (7.73)	2.42 (4.66)	1.66 (2.26)	2.89 (14.65)	3.08 (9.03)	2.41 (5.36)	1.77 (2.70)	4.19 (17.09)
T_5 : Mulching with coir pith at 5 t/ha	2.00 (3.53)	1.95 (3.76)	2.90 (7.29)	2.54 (6.85)	2.32 (5.86)	3.53 (12.71)	3.28 (9.53)	2.79 (7.80)	2.55 (6.89)	5.05 (24.22)	3.65 (10.80)	2.62 (6.43)	2.51 (7.34)	5.35 (24.57)
T_6 : Mulching with Pongamia leaves at 5 t/ha	2.18 (4.26)	2.00 (3.89)	2.95 (8.15)	2.63 (6.15)	2.39 (5.89)	3.59 (12.84)	3.31 (9.00)	2.85 (7.89)	2.61 (6.91)	5.12 (23.80)	3.71 (11.30)	2.71 (7.06)	2.55 (7.39)	5.45 (25.75)
T_7 : Mulchng with glyricidia leaves at 5 t/ha	2.29 (4.80)	2.05 (3.93)	2.98 (8.73)	2.71 (7.00)	2.49 (5.93)	3.69 (12.93)	3.35 (10.43)	2.89 (7.90)	2.62 (6.95)	5.14 (25.28)	3.80 (12.00)	2.79 (7.36)	2.61 (7.40)	5.49 (26.76)
T_8 : Pendimethalin 1 kg ai/ha	1.66 (2.26)	1.33 (1.30)	2.01 (3.56)	1.82 (2.83)	1.51 (1.83)	2.27 (4.66)	2.41 (5.36)	2.00 (3.53)	1.66 (2.26)	3.41 (11.15)	2.56 (6.10)	2.19 (4.49)	1.77 (2.70)	3.70 (13.29)
T_9 : Unweeded control	2.29 (6.20)	2.16 (4.20)	3.30 (10.40)	2.81 (7.26)	2.54 (6.03)	3.73 (13.29)	3.45 (11.53)	3.01 (8.40)	2.76 (7.16)	5.24 (27.09)	3.82 (13.90)	2.85 (7.53)	2.75 (7.42)	5.54 (28.85)
T_{10} : Hand weeding at 20 DAS	2.39 (5.23)	1.93 (3.26)	2.99 (8.49)	2.61 (6.33)	2.43 (4.96)	3.37 (11.29)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	2.35 (5.06)	2.09 (3.93)	1.63 (2.20)	3.41 (11.19)
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.10	0.08	0.11	0.09	0.10	0.09	0.07	0.10	0.09	0.08	0.07	0.17	0.11	0.09
C.D. at 0.05	0.31	0.24	0.33	0.29	0.30	0.28	0.21	0.30	0.27	0.24	0.22	0.53	0.33	0.28

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing; Figures in the parantheses indicate original values.

soil solarization with TP for 30 days (1.05 to 1.33 g/0.25 m^2). Pendimethalin at 1 kg a.i./ha (1.33 to 1.77 g/0.25 m^2) differed significantly with the control (2.16 to 2.75 g/0.25 m^2).

4.4.2.3 Dry matter production of sedges

Hand weeding at 20 DAS recorded least dry matter production of sedges (0.70 to 2.35 g/0.25 m^2) and differed significantly with soil solarization for 30 days TP (2.64 to 2.90 g/0.25 m^2). Pendimethalin at 1 kg a.i./ha had less dry matter production of sedges (2.41 to 2.56 g/0.25 m^2) and differed significantly with the control (3.45 to 3.82 g/0.25 m^2).

4.4.2.4 Dry matter production of total weeds

Mulching with coir pith, pongamia and glyricidia leaves recorded more dry matter production of total weeds and were found on par with the control till 28 DAS. Soil solarization with TP for 30 days recorded least dry matter production of total weeds (1.38 to 3.40 g/0.25 m^2) and differed significantly with soil solarization for 30 days BP (2.04 to 4.19 g/0.25 m^2).

4.4.3 Dry matter production of weeds in chilli nursery

The observations recorded on weeds dry weight at weekly intervals in chilli are presented in Table 4.3c and Fig. 4.2a.

Table 4.3c Effect of weed control treatments on dry matter production (g/0.25m²) and its distribution at weekly intervals in chilli nursery.

Treatments	Days after sowing													
	7			14			21				28			
	Mono-cots	Di-cots	Total No. of weeds	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds
T_1 : Soil solarization 15 days TP	1.16 (0.86)	1.05 (0.63)	1.40 (1.49)	1.33 (1.30)	1.22 (1.00)	1.66 (2.55)	2.80 (7.06)	1.52 (1.90)	1.51 (1.83)	3.34 (10.79)	2.92 (8.06)	1.82 (2.86)	1.60 (2.26)	3.69 (13.18)
T_2 : Soil solarization 30 days TP	1.05 (0.63)	0.89 (0.33)	1.24 (0.96)	1.19 (0.93)	1.05 (0.63)	1.42 (1.56)	2.74 (7.40)	1.33 (1.30)	1.22 (1.00)	3.19 (9.70)	2.79 (7.36)	1.52 (1.90)	1.40 (1.53)	3.36 (10.79)
T_3 : Soil solarization 15 days BP	1.82 (2.86)	1.51 (1.83)	2.26 (4.69)	1.93 (3.26)	1.82 (2.86)	2.56 (6.12)	2.89 (7.86)	2.35 (5.06)	2.05 (3.76)	4.13 (16.68)	3.10 (9.13)	2.52 (5.86)	2.27 (4.66)	4.48 (19.65)
T_4 : Soil solarization 30 days BP	1.70 (2.43)	1.33 (1.30)	2.04 (3.73)	1.82 (2.83)	1.51 (1.83)	2.22 (4.66)	2.79 (7.36)	2.18 (4.26)	1.93 (3.26)	3.92 (14.88)	3.02 (8.63)	2.44 (5.46)	2.18 (4.26)	4.34 (18.35)
T_5 : Mulching with coir pith at 5 t/ha	2.00 (3.90)	1.82 (3.26)	2.71 (7.16)	2.49 (6.39)	2.38 (5.52)	3.29 (11.91)	2.92 (8.10)	2.64 (6.00)	2.62 (7.23)	4.69 (21.33)	3.35 (10.90)	2.86 (7.83)	2.71 (7.61)	4.99 (26.34)
T_6 : Mulching with Pongamia leaves at 5 t/ha	2.12 (3.95)	1.90 (3.82)	2.80 (7.72)	2.52 (6.49)	2.42 (5.63)	3.35 (12.12)	3.00 (8.53)	2.70 (6.46)	2.77 (7.31)	4.79 (22.30)	3.41 (11.20)	2.93 (7.93)	2.85 (7.79)	5.02 (26.92)
T_7 : Mulchng with glyricidia leaves at 5 t/ha	2.15 (3.98)	1.95 (3.87)	2.83 (7.85)	2.56 (6.50)	2.41 (5.60)	3.41 (12.10)	3.03 (8.73)	2.79 (6.70)	2.79 (7.39)	4.83 (22.82)	3.49 (11.90)	2.97 (7.95)	2.91 (7.83)	5.10 (27.68)
T_8 : Pendimethalin 1 kg ai/ha	1.52 (1.90)	1.22 (1.00)	1.82 (2.90)	1.70 (2.43)	1.45 (1.70)	2.12 (4.13)	2.32 (4.96)	2.12 (4.03)	2.00 (3.53)	3.60 (12.52)	2.52 (5.86)	2.27 (4.66)	2.09 (3.93)	3.86 (14.45)
T_9 : Unweeded control	2.31 (4.93)	2.21 (4.43)	3.13 (9.36)	2.68 (6.70)	2.52 (5.86)	3.61 (12.56)	3.16 (9.53)	2.92 (8.06)	2.81 (7.46)	5.04 (25.05)	3.54 (12.16)	3.06 (8.93)	3.00 (8.53)	5.20 (29.62)
T_{10} : Hand weeding at 20 DAS	2.26 (4.20)	2.16 (3.91)	2.86 (8.11)	2.60 (6.46)	2.43 (4.93)	3.44 (11.39)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	2.35 (5.06)	2.12 (4.03)	1.77 (2.70)	3.50 (11.79)
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.11	0.10	0.14	0.10	0.13	0.11	0.08	0.09	0.15	0.11	0.08	0.09	0.11	0.07
C.D. at 0.05	0.35	0.32	0.43	0.29	0.38	0.33	0.26	0.29	0.45	0.35	0.24	0.28	0.33	0.23

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing; Figures in the parantheses indicate original values.

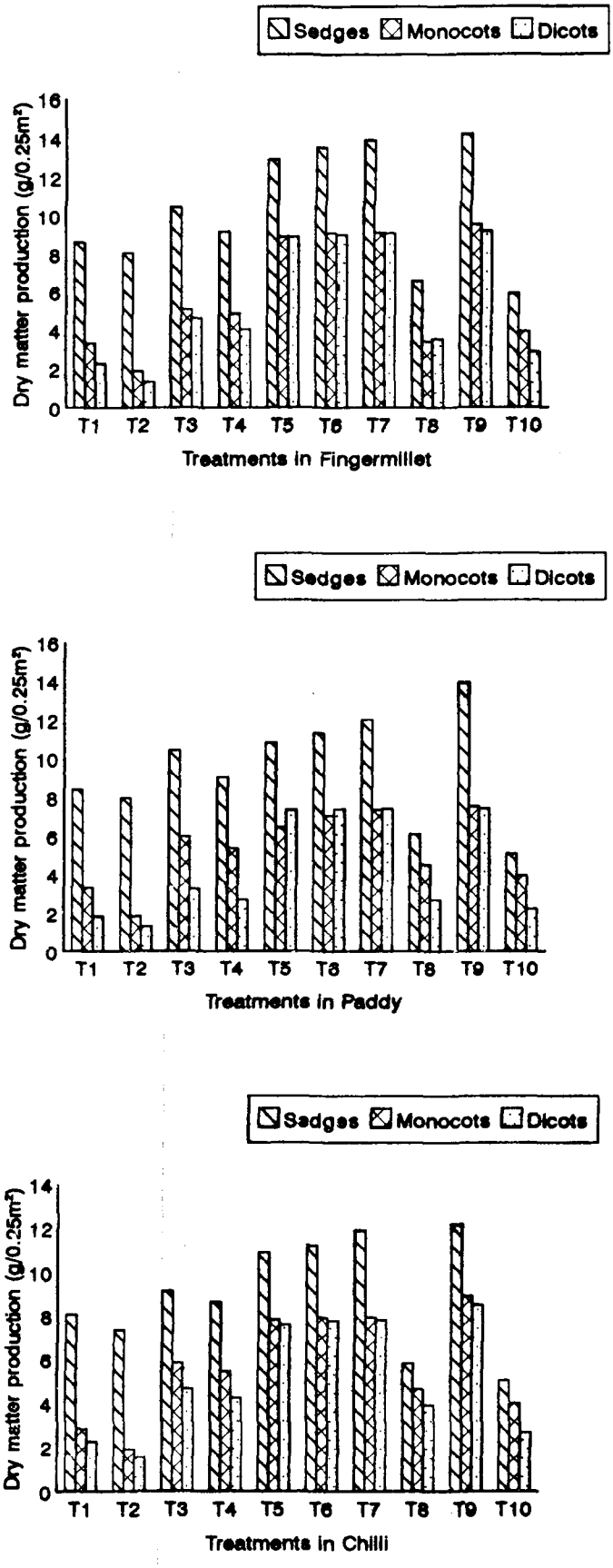


Fig.4.2a: Drymatter production (g/0.25m²) of sedge, monocot, dicot weeds as influenced by weed control treatments at 28 days after sowing in fingermillet, paddy and chilli nursery.

Dry matter production of monocots, dicots, sedges and total weeds differed significantly among the treatments.

4.4.3.1 Dry matter production of monocot weeds

Soil solarization with BP for 30 days had more dry matter production of monocots (1.70 to 2.44 g/0.25 m^2) as compared to soil solarization with TP for 30 days (1.05 to 1.52 g/0.25 m^2). Pendimethalin at 1 kg a.i./ha (1.52 to 2.27 g/0.25 m^2) and differed significantly with the control (2.31 to 3.06/0.25 m^2) till fourth WAS.

4.4.3.2 Dry matter production of dicot weeds

Soil solarization with TP for 30 days recorded least dry matter production of dicots (0.89to 1.40 g/0.25 m^2) followed by soil solarization with TP for 15 days (1.05 to 1.60 g/0.25 m^2) and both differed significantly with soil solarization for 15 days BP (1.51 to 2.27 g/0.25 m^2). Mulching with coir pith, pongamia and glyricidia leaves did not differ significantly with the control.

4.4.3.3 Dry matter production of sedges

Hand weeding at 20 DAS recorded least dry matter production of sedges (0.70 to 2.35 g/0.25 m^2) followed by pendimethalin at 1 kg a.i./ha (2.32 to 2.52 g/0.25 m^2) and differed significantly with soil solarization for 30days TP (2.74 to 2.79 g/0.25 m^2). Soil solarization with BP for

15 days (2.89 to 3.10 g/0.25 m^2) did not differ significantly with BP for 30 days (2.79 to 3.02 g/0.25 m^2).

4.4.3.4 Dry matter production of total weeds

Soil solarization with TP for 15 days recorded more dry matter production of total weeds (1.40 to 3.69 g/0.25 m^2) than soil solarization with TP for 30 days (1.24 to 3.36 g/0.25 m^2) till fourth WAS. Pendimethalin at 1 kg a.i./ha (1.82 to 3.86 g/0.25 m^2) and differed significantly with the control (3.13 to 5.20 g/0.25 m^2). Mulching with coir pith, pongamia and glyricidia leaves were found on par with the control.

4.4.4 Dry matter production of weeds in tomato nursery

The observations recorded on weeds dry weight at weekly intervals in tomato nursery are presented in Table 4.3d and Fig. 4.2b.

Dry matter production of monocots, dicots, sedges and total weeds differed significantly among the treatments.

4.4.4.1 Dry matter production of monocots

Mulching with coir pith, pongamia and glyricidia leaves were found on par with the control till 28 DAS. Soil solarization with BP for 30 days recorded more dry matter production of monocots (1.70 to 2.41 g/0.25 m^2) than soil solarization with TP for 30 days (1.16 to 1.70 g/0.25 m^2).

Table 4.3d Effect of weed control treatments on dry matter production (g/0.25m²) and its distribution at weekly intervals in tomato nursery.

Treatments	Days after sowing													
	7			14			21				28			
	Mono-cots	Di-cots	Total No. of weeds	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds
T_1 : Soil solarization 15 days TP	1.26 (1.13)	1.16 (0.86)	1.56 (1.99)	1.58 (2.03)	1.09 (1.00)	2.13 (3.03)	2.79 (7.36)	1.70 (2.43)	1.37 (1.46)	3.49 (11.25)	3.31 (10.53)	1.74 (3.33)	1.51 (1.83)	4.02 (15.69)
T_2 : Soil solarization 30 days TP	1.16 (0.86)	0.99 (0.53)	1.36 (1.39)	1.33 (1.30)	1.22 (0.73)	1.57 (2.03)	2.75 (7.13)	1.51 (1.83)	1.26 (1.13)	3.25 (10.29)	3.00 (10.60)	1.70 (2.50)	1.36 (1.43)	3.86 (14.53)
T_3 : Soil solarization 15 days BP	1.82 (2.86)	1.44 (1.60)	2.26 (4.46)	2.26 (4.66)	1.70 (2.50)	2.75 (7.16)	3.06 (8.93)	2.41 (5.36)	1.66 (2.40)	4.14 (16.69)	3.41 (9.83)	2.52 (5.93)	1.98 (3.50)	4.43 (19.26)
T_4 : Soil solarization 30 days BP	1.70 (2.43)	1.33 (1.30)	2.05 (3.73)	2.06 (3.76)	1.51 (1.83)	2.46 (5.59)	2.89 (7.86)	2.26 (4.66)	1.44 (1.63)	3.82 (14.15)	3.39 (9.13)	2.41 (5.36)	1.82 (2.86)	4.22 (17.35)
T_5 : Mulching with coir pith at 5 t/ha	2.09 (3.86)	2.01 (3.76)	2.90 (7.62)	2.50 (5.36)	2.29 (5.38)	3.35 (10.74)	3.19 (10.89)	2.83 (7.53)	2.54 (6.90)	4.98 (25.32)	3.45 (11.53)	2.79 (7.36)	2.62 (6.46)	4.94 (25.35)
T_6 : Mulching with Pongamia leaves at 5 t/ha	2.11 (4.00)	2.08 (3.83)	3.10 (7.83)	2.59 (5.73)	2.38 (5.40)	3.41 (11.13)	3.24 (10.98)	2.85 (7.63)	2.61 (7.04)	5.01 (25.65)	3.49 (11.69)	2.81 (7.56)	2.67 (6.73)	5.14 (25.98)
T_7 : Mulchng with glyricidia leaves at 5 t/ha	2.18 (4.26)	2.11 (4.00)	3.09 (8.26)	2.61 (6.33)	2.39 (5.80)	3.52 (12.13)	3.31 (11.20)	2.89 (7.86)	2.69 (7.16)	5.03 (26.22)	3.52 (12.00)	2.83 (7.61)	2.71 (6.79)	5.12 (26.40)
T_8 : Pendimethalin 1 kg ai/ha	1.51 (1.83)	1.22 (1.00)	1.81 (2.83)	1.95 (3.36)	1.47 (1.73)	2.29 (5.09)	2.23 (4.56)	2.06 (3.76)	1.51 (1.83)	3.70 (10.15)	2.54 (5.96)	2.21 (4.43)	1.82 (2.86)	3.70 (13.25)
T_9 : Unweeded control	2.41 (5.36)	2.27 (1.89)	3.24 (7.25)	2.74 (7.06)	2.54 (6.08)	3.68 (13.14)	3.45 (11.53)	2.96 (8.30)	2.79 (7.36)	5.20 (27.19)	3.70 (13.23)	2.90 (7.96)	3.08 (9.06)	5.20 (30.25)
T_{10} : Hand weeding at 20 DAS	2.36 (4.66)	2.01 (3.10)	2.877 (7.76)	2.83 (7.53)	2.39 (5.80)	3.65 (13.33)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	2.35 (5.06)	2.05 (3.76)	1.66 (2.40)	3.42 (11.22)
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.13	0.09	0.11	0.08	0.14	0.13	0.09	0.08	0.16	0.09	0.08	0.17	0.17	0.09
C.D. at 0.05	0.41	0.28	0.34	0.25	0.44	0.40	0.29	0.26	0.47	0.27	0.26	0.50	0.51	0.27

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing; Figures in the parantheses indicate original values.

Hand weeding at 20 DAS had less dry matter production of monocots (0.70 to 2.05 g/0.25 m^2) on third and fourth WAS than soil solarization with BP for 30 days (2.26 to 2.41 g/0.25 m^2).

4.4.4.2 Dry matter production of dicots

Soil solarization with TP for 30 days recorded least dry matter production of dicots (0.99 to 1.36 g/0.25 m^2) and differed significantly with soil solarization for 30 days BP (1.33 to 1.82 g/0.25 m^2) till fourth WAS. Pendimethalin at 1 kg a.i./ha had less dry matter production of dicots (1.22 to 1.82 g/0.25 m^2) than soil solarization with BP for 30 days (1.33 to 1.82 g/0.25 m^2).

4.4.4.3 Dry matter production of sedges

Hand weeding at 20 DAS had least dry matter production of sedges (0.70 to 2.35 g/0.25 m^2) on third and fourth WAS followed by pendimethalin at 1 kg a.i./ha (2.23 to 2.54 g/0.25 m^2). Soil solarization with BP for 30 days (2.89 to 3.39 g/0.25 m^2) did not differ significantly with soil solarization for 15 days BP (3.06 to 3.41 g/0.25 m^2).

4.4.4.4 Dry matter production of total weeds

Pendimethalin at 1 kg a.i./ha recorded less dry matter production of total weeds (1.81 to 3.70 g/0.25 m^2) than soil

solarization with BP for 30 days (2.05 to 4.22 g/0.25 m^2). Soil solarization with TP for 30 days (1.36 to 3.86 g/0.25 m^2). Soil solarization with TP for 30 days (1.36 to 3.86 g/0.25 m^2) did not differ significantly in soil solarization with TP for 15 days (1.56 to 4.02 g/0.25 m^2) till 28 DAS.

4.4.5 Dry matter production of weeds in capsicum nursery

The data recorded on dry weight of weeds at weekly intervals in capsicum nursery are presented in Table 4.3e and Fig.4.2b.

Dry matter production of monocots, dicots, sedges and total weeds differed significantly among the treatments.

4.4.5.1 Dry matter production of moncots

Soil solarization with BP for 30 days recorded more dry matter production of monocots (1.51 to 2.27 g/0.25 m^2) than soil solarization with TP for 30 days (0.99 to 1.33 g/0.25 m^2). Mulching with coir pith, pongamia and glyricidia leaves did not differ significantly with the control.

4.4.5.2 Dry matter production of dicots

Soil solarization with TP for 30 days recorded least dry matter production of dicots (0.96 to 1.33 g/0.25 m^2) and differed significantly with pendimethalin at 1 kg a.i./ha (1.26 to 1.70 g/0.25 m^2) till 28 DAS. More dry matter production of dicots was observed in unweeded control (1.94

Table 4.3e Effect of weed control treatments on dry matter production (g/0.25 m^2) and its distribution at weekly intervals in capsicum nursery.

Treatments	Days after sowing													
	7			14			21				28			
	Mono-cots	Di-cots	Total No. of weeds	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds
T_1 : Soil solarization 15 days TP	1.09 (0.73)	1.09 (0.61)	1.37 (1.34)	1.19 (0.93)	1.22 (1.00)	1.55 (1.93)	2.92 (8.10)	1.51 (1.83)	1.37 (1.40)	3.38 (11.33)	3.10 (9.16)	1.70 (2.46)	1.51 (1.83)	3.72 (13.45)
T_2 : Soil solarization 30 days TP	0.99 (0.53)	0.96 (0.46)	1.29 (0.99)	1.09 (0.73)	1.05 (0.63)	1.34 (1.36)	2.84 (7.60)	1.22 (1.00)	1.20 (1.13)	3.19 (9.73)	3.02 (8.63)	1.33 (1.30)	1.33 (1.30)	3.42 (11.23)
T_3 : Soil solarization 15 days BP	1.66 (2.40)	1.45 (1.70)	2.11 (4.10)	1.89 (3.10)	1.63 (2.26)	2.44 (5.36)	3.05 (8.83)	2.27 (4.46)	1.82 (4.83)	4.10 (18.12)	3.19 (9.70)	2.39 (5.23)	2.15 (4.16)	4.42 (19.09)
T_4 : Soil solarization 30 days BP	1.51 (1.83)	1.33 (1.30)	1.90 (3.13)	1.68 (2.40)	1.47 (1.73)	2.18 (4.13)	3.00 (8.53)	2.06 (3.76)	1.63 (4.66)	3.87 (16.95)	3.12 (9.56)	2.27 (4.66)	1.77 (2.66)	4.17 (16.88)
T_5 : Mulching with coir pith at 5 t/ha	2.12 (4.20)	1.66 (2.40)	2.60 (6.60)	2.49 (6.31)	2.15 (5.21)	3.22 (11.52)	3.20 (9.74)	2.56 (6.71)	2.35 (5.33)	4.89 (21.78)	3.65 (13.03)	2.67 (6.58)	2.61 (6.03)	5.06 (25.64)
T_6 : Mulching with Pongamia leaves at 5 t/ha	2.16 (4.83)	1.79 (2.51)	2.66 (7.34)	2.51 (6.41)	2.31 (5.28)	3.25 (11.69)	3.25 (9.90)	2.61 (6.81)	2.39 (6.00)	4.98 (22.71)	3.71 (13.20)	2.80 (7.50)	2.67 (6.70)	5.08 (27.40)
T_7 : Mulchng with glyricidia leaves at 5 t/ha	2.21 (4.91)	1.80 (2.59)	2.63 (7.00)	2.59 (6.61)	2.41 (5.50)	3.31 (12.11)	3.31 (10.80)	2.62 (6.89)	2.54 (6.03)	5.02 (23.72)	3.82 (13.90)	2.80 (7.50)	2.67 (7.40)	5.29 (28.80)
T_8 : Pendimethalin 1 kg ai/ha	1.33 (1.30)	1.26 (1.13)	1.70 (2.43)	1.51 (1.83)	1.33 (1.30)	1.70 (3.13)	2.19 (4.40)	1.84 (2.93)	1.63 (2.23)	3.16 (9.56)	2.45 (5.56)	2.12 (4.03)	1.70 (2.50)	3.51 (12.09)
T_9 : Unweeded control	2.35 (5.06)	1.94 (3.33)	2.98 (8.39)	2.70 (6.83)	2.50 (5.80)	3.62 (12.63)	3.43 (11.30)	2.89 (7.86)	2.76 (7.16)	5.14 (26.32)	3.83 (14.21)	2.94 (8.16)	3.03 (8.73)	5.30 (31.10)
T_{10} : Hand weeding at 20 DAS	2.21 (4.43)	1.84 (2.93)	2.80 (7.36)	2.61 (6.33)	2.25 (4.46)	3.38 (10.79)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	2.35 (5.06)	1.89 (3.10)	1.63 (2.23)	3.30 (10.39)
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.14	0.09	0.12	0.07	0.16	0.14	0.09	0.12	0.16	0.10	0.05	0.09	0.13	0.08
C.D. at 0.05	0.42	0.26	0.38	0.23	0.48	0.41	0.28	0.35	0.47	0.29	0.17	0.28	0.40	0.24

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing; Figures in the parantheses indicate original values.

to 3.03 g/0.25 m^2). Soil solarization with BP for 30 days had less dry matter production of dicots (1.33 to 1.77 g/0.25 m^2) than soil solarization with BP for 15 days (1.45 to 2.15 g/0.25 m^2).

4.4.5.3 Dry matter production of sedges

Hand weeding at 20 DAS recorded least dry matter production of sedges (0.70 to 2.35 g/0.25 m^2) followed by pendimethalin at 1 kg a.i./ha (2.19 to 2.45 g/0.25 m^2). Soil solarization with TP for 30 days (2.84 to 3.02 g/0.25 m^2) did not differ significantly with soil solarization for 15 days TP (2.92 to 3.10 g/0.25 m^2).

4.4.5.4 Dry matter production of total weeds

Soil solarization with TP for 30 days recorded least dry matter production of total weeds (1.29 to 3.42 g/0.25 m^2) and differed significantly with soil solarization for 15 days and 30 days BP. (2.11 to 4.42 g/0.25 m^2 and 1.90 to 4.17 g/0.25 m^2) till 28 DAS. Mulching with coir pith, pongamia and glyricidia leaves did not differ significantly with control till 28 DAS.

4.4.6 Dry matter production of weeds in tobacco nursery

The data recorded on weeds dry weight at weekly intervals in tobacco nursery are presented in Table 4.3f and Fig. 4.2b.

Table 4.3f Effect of weed control treatments on dry matter production (g/0.25m²) and its distribution at weekly intervals in tobacco nursery.

Treatments	Days after sowing																					
	7			14			21				28				35				42			
	Mono-cots	Di-cots	Total No. of weeds	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds	Sedges	Mono-cots	Di-cots	Total No.of weeds
T_1 : Soil solarization 15 days TP	1.16 (0.86)	1.06 (0.76)	1.48 (1.62)	1.37 (1.40)	1.23 (1.03)	1.71 (2.43)	2.96 (8.30)	1.66 (2.26)	1.47 (1.73)	3.57 (12.29)	3.05 (8.83)	1.82 (2.83)	1.50 (1.83)	3.74 (13.49)	3.12 (9.26)	2.00 (3.53)	1.66 (2.26)	3.94 (15.06)	3.20 (9.80)	2.18 (4.26)	1.93 (3.26)	4.22 (17.33)
T_2 : Soil solarization 30 days TP	0.96 (0.43)	0.99 (0.50)	1.18 (0.93)	1.09 (0.73)	1.05 (0.63)	1.34 (1.36)	2.90 (7.96)	1.33 (1.30)	1.23 (1.03)	3.28 (10.29)	2.98 (8.40)	1.51 (1.83)	1.33 (1.30)	3.46 (11.53)	2.84 (8.63)	1.70 (2.43)	1.51 (1.83)	3.65 (12.90)	3.05 (8.83)	2.00 (3.53)	1.77 (2.66)	3.94 (15.03)
T_3 : Soil solarization 15 days BP	1.70 (2.43)	1.40 (1.50)	2.10 (3.93)	2.06 (3.83)	1.77 (2.66)	2.63 (7.85)	3.02 (8.63)	2.38 (5.20)	2.06 (3.76)	4.25 (17.59)	3.17 (9.56)	2.52 (5.93)	2.27 (3.33)	4.54 (18.82)	3.53 (12.03)	2.66 (6.60)	2.44 (5.46)	4.95 (24.10)	3.69 (13.16)	2.79 (7.33)	2.56 (6.10)	5.20 (26.56)
T_4 : Soil solarization 30 days BP	1.51 (1.83)	1.33 (1.30)	1.89 (3.13)	1.82 (2.83)	1.66 (2.26)	2.36 (5.09)	2.99 (8.50)	2.26 (4.66)	1.93 (3.26)	4.11 (16.42)	3.10 (9.16)	2.41 (5.36)	2.06 (3.76)	4.33 (18.22)	3.29 (9.70)	2.56 (6.10)	2.12 (4.03)	4.50 (19.83)	3.28 (10.26)	2.68 (6.73)	2.30 (4.83)	4.72 (21.83)
T_5 : Mulching with coir pith at 5 t/ha	2.19 (4.65)	1.89 (2.83)	2.89 (7.48)	2.53 (6.21)	2.26 (5.28)	3.31 (11.49)	3.16 (8.83)	2.66 (6.60)	2.54 (5.92)	4.90 (21.35)	3.57 (12.16)	2.67 (6.70)	2.70 (8.16)	5.21 (27.02)	3.89 (12.56)	2.98 (7.30)	2.91 (5.96)	5.70 (25.83)	3.98 (13.66)	3.01 (7.86)	3.01 (5.86)	5.98 (27.40)
T_6 : Mulching with Pongamia leaves at 5 t/ha	2.23 (4.82)	1.98 (2.93)	2.91 (7.75)	2.61 (6.39)	2.31 (5.42)	3.35 (11.81)	3.20 (9.16)	2.68 (6.70)	2.61 (6.21)	4.98 (22.07)	3.61 (12.28)	2.80 (7.40)	2.81 (8.26)	5.31 (27.94)	3.91 (13.16)	3.01 (8.06)	2.98 (6.70)	5.81 (27.93)	4.01 (14.46)	3.12 (8.43)	3.09 (7.53)	6.02 (30.43)
T_7 : Mulchng with glyricidia leaves at 5 t/ha	2.31 (4.98)	2.01 (3.91)	3.01 (8.89)	2.65 (6.48)	2.35 (5.38)	3.36 (11.86)	3.21 (9.53)	2.80 (7.40)	2.69 (6.31)	5.01 (23.24)	3.69 (12.31)	3.07 (7.73)	2.89 (8.32)	5.39 (28.36)	3.98 (30.83)	3.05 (5.33)	3.01 (7.53)	5.89 (29.36)	4.05 (14.93)	3.15 (8.50)	3.12 (3.10)	6.12 (31.53)
T_8 : Pendimethalin 1 kg ai/ha	1.33 (1.30)	1.26 (1.10)	1.70 (2.40)	1.63 (2.20)	1.51 (1.83)	2.12 (4.03)	2.54 (5.96)	2.09 (3.93)	2.32 (2.86)	3.64 (12.75)	2.61 (6.33)	2.26 (4.66)	1.94 (3.33)	3.84 (14.32)	2.89 (7.86)	2.39 (5.23)	2.12 (4.03)	4.19 (17.13)	3.03 (8.70)	2.59 (6.23)	2.35 (5.06)	4.50 (19.83)
T_9 : Unweeded control	2.44 (5.46)	2.16 (4.20)	3.18 (9.66)	2.74 (7.06)	2.53 (5.96)	3.67 (13.02)	3.27 (10.02)	2.89 (7.93)	2.82 (7.50)	5.10 (25.63)	3.75 (13.60)	2.86 (8.93)	2.98 (8.43)	5.60 (30.96)	4.07 (16.10)	3.16 (9.50)	3.10 (9.16)	5.93 (34.76)	4.18 (17.00)	3.26 (10.16)	3.19 (9.70)	6.11 (36.86)
T_{10} : Hand weeding at 20 DAS	2.09 (3.93)	1.94 (3.33)	2.77 (7.26)	2.62 (6.43)	2.41 (5.36)	3.50 (11.79)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	2.39 (5.23)	2.09 (3.93)	1.66 (12.26)	3.45 (11.42)	2.89 (7.86)	2.35 (5.06)	5.93 (3.26)	4.08 (16.20)	2.93 (8.10)	2.54 (5.96)	2.12 (4.03)	4.31 (18.10)
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.10	0.09	0.11	0.09	0.10	0.12	0.43	0.11	0.10	0.06	0.06	0.10	0.09	0.10	0.05	0.06	0.06	0.07	0.03	0.04	0.05	0.04
C.D. at 0.05	0.29	0.28	0.33	0.28	0.31	0.36	0.11	0.33	0.29	0.20	0.20	0.30	0.29	0.32	0.14	0.15	0.19	0.23	0.10	0.12	0.16	0.13

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet; DAS = Days after sowing; Figures in the paramtheses indicate original values.

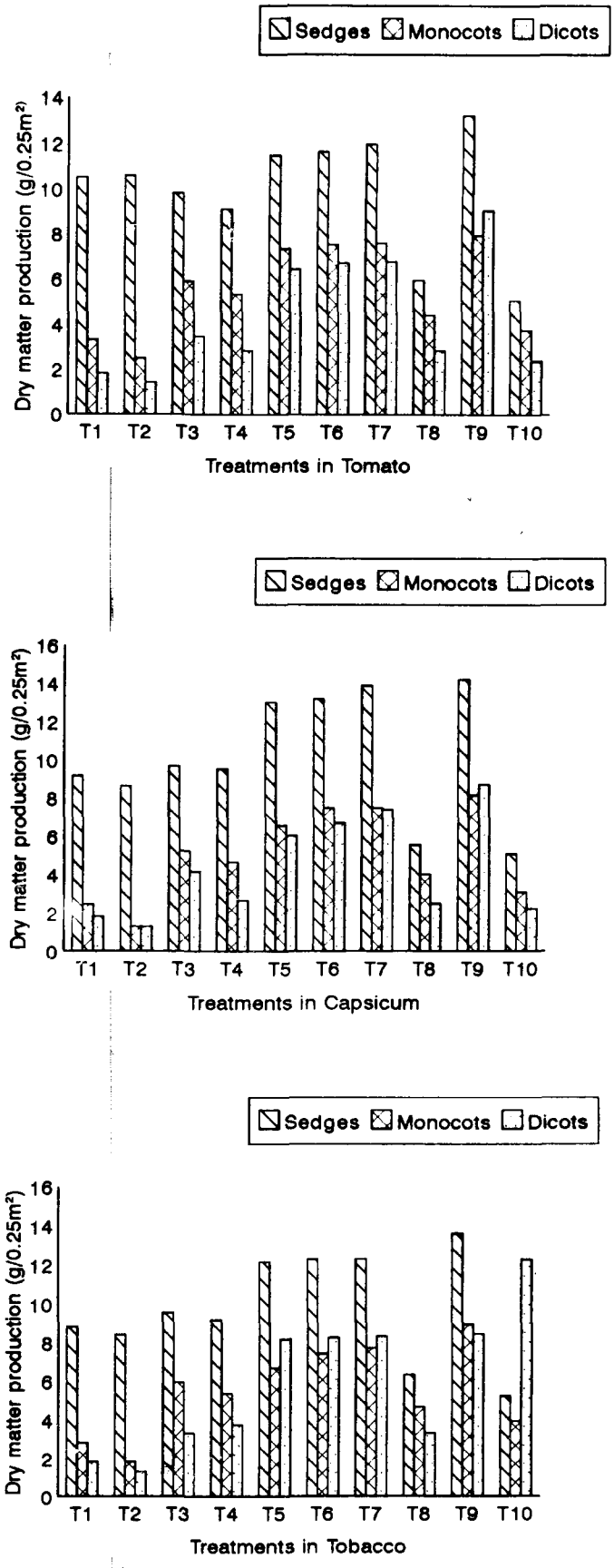


Fig.4.2b: Drymatter production (g/0.25m²) of sedge, monocot, dicot weeds as influenced by weed control treatments at 28 days after sowing in tomato, capsicum and tobacco nursery.

Dry matter production of monocots, dicots, sedges and total weeds differed significantly among the treatments.

4.4.6.1 Dry matter production of monocots

Mulching with coir pith, pongamia and glyricidia leaves were on par with the control and recorded more dry matter production of monocots than any other treatments till 42 DAS. Soil solarization with TP for 30 days recorded least dry matter production of monocots (0.96 to 2.00 g/0.25 m^2) followed by soil solarization with TP for 15 days (1.16 to 2.18 g/0.25 m^2).

4.4.6.2 Dry matter production of dicots

Transparent polyethelene mulch in general recorded less dry matter production of dicots over black polyethylene till sixth WAS. Soil solarization with TP for 15 days (1.06 to 1.93 g/0.25 m^2) and 30 days (0.99 to 2.56 g/0.25 m^2) recorded less dry matter production of dicots than soil solarization with BP for 15 days (1.40 to 1.77 g/0.25 m^2) and 30 days (1.33 to 2.30 g/0.25 m^2) till 42 DAS. Pendimethalin at 1 kg a.i./ha (1.26 to 2.35 g/0.25 m^2) differed significantly with the control (2.16 to 3.19 g/0.25 m^2).

4.4.6.3 Dry matter production of sedges

Hand weeding at 20 DAS recorded least dry matter production of sedges (0.70 to 2.93 g/0.25 m^2) followed by

pendimethalin at 1 kg a.i./ha (2.54 to 3.03 g/0.25 m^2) on third and sixth week after sowing and differed significantly with the control (3.27 to 4.18 g/0.25 m^2). Soil solarization with BP for 15 days (3.02 to 3.69 g/0.25 m^2) did not differ significantly with soil solarization for 30 days BP (2.99 to 3.28 g/0.25 m^2).

4.4.6.4 Dry matter production of total weeds

Soil solarization with BP for 30 days recorded more total dry matter production (1.89 to 4.72 g/0.25 m^2) than soil solarization with BP for 15 days (2.10 to 5.20 g/0.25 m^2) till 42 DAS. Mulching with coir pith, pongamia and glyricidia leaves did not differ significantly with the control. Pendimethalin at 1 kg a.i./ha (1.70 to 4.50 g/0.25 m^2) recorded more dry matter production of total weeds than soil solarization with TP for 15 days (1.48 to 4.22 g/0.25 m^2).

4.5 Effect of weed control treatments on germination percentage of nursery crops

The observations on germination percentage recorded one week after germination in different nursery is presented in Table 4.4.

In finger millet highest germination percentage recorded in soil solarization with TP for 30 days (92.3%) followed by soil solarization with TP for 15 days (91.1%)

Table 4.4 Effect of weed control treatments on total number of plants (0.25 m^2) and their germination percentrage in nursery crops.

Treatments	Finger millet		Paddy		Chilli		Tomato		Capsicum		Tobacco	
	No. of plants	Germination (%)	No. of plants	Germination (%)	No. of plants	Germination (%)	No. of plants	Germination (%)	No. of plants	Germination (%)	No. of plants	Germination (%)
T_1 : Soil solarization 15 days TP	27.40 (728.65)	91.10	73.36	92.06	203.97	88.30	178.40	89.20	202.81	87.80	15.52 (240.43)	86.80
T_2 : Soil solarization 30 days TP	27.17 (738.33)	92.30	74.33	93.10	209.97	90.90	180.60	90.30	210.44	91.10	15.74 (247.36)	89.30
T_3 : Soil solarization 15 days BP	26.42 (695.15)	86.90	69.00	86.10	198.42	85.90	166.40	83.20	194.73	84.30	15.37 (234.06)	84.50
T_4 : Soil solarization 30 days BP	26.43 (698.33)	87.30	71.66	89.70	200.27	86.70	178.80	85.90	198.42	85.90	15.38 (236.28)	85.30
T_5 : Mulching with coir pith at 5 t/ha	26.12 (682.30)	85.30	68.66	86.20	197.04	85.30	164.60	82.30	194.27	84.10	15.11 (227.97)	82.30
T_6 : Mulching with Pongamia leaves at 5 t/ha	26.10 (681.50)	85.20	63.66	85.90	195.88	84.80	166.00	83.00	193.80	83.90	15.17 (229.91)	83.00
T_7 : Mulchng with glyricidia leaves at 5 t/ha	26.06 (679.15)	84.90	67.50	84.80	194.27	84.10	165.00	82.50	193.11	83.60	15.22 (231.29)	83.50
T_8 : Pendimethalin 1 kg ai/ha	0.70 (0.00)	0.00	65.66	82.10	194.73	84.30	160.40	80.20	191.26	82.80	0.70 (0.00)	0.00
T_9 : Unweeded control	26.01 (676.65)	84.60	66.33	83.10	193.80	83.90	166.40	83.10	194.27	84.10	15.14 (229.00)	82.70
T_{10} : Hand weeding at 20 DAS	26.06 (679.15)	84.90	67.00	84.10	185.03	80.10	164.40	82.20	192.88	83.50	15.16 (229.63)	82.90
F test	*		*		*		*		*		*	
S.Em ±	0.80		1.79		1.25		0.85		1.17		0.12	
C.D. at 0.05	1.69		5.31		3.72		2.53		3.48		0.25	

* = Significant at 5%; TP = Transparent polyethylene sheet; BP : Black polyethylene sheet;
Figures in parantheses indicate original values.

percentage. Germination was found to be nil in pendimethalin treated plot.

In paddy, black polyethelene mulch recorded less germination percentage than transparent polyethylene. Pendimethalin treated plot showed less percentage (82.1%) than control (83.1%).

In chilli soil solarization with BP for 30 days recorded less percentage (86.7%) than soil solarization with TP for 15 days (88.3%). Among all the treatments, hand weeding 20 DAS recorded less germination percentage (80.1%).

In tomato, highest germination percentage was recorded in soil solarization with TP for 30 days (90.3%) followed by soil solarization with TP for 15 days (89.2%). Pendimethalin treated plot recorded less percentage (80.2%) compared to all other treatments.

In capsicum, mulching with coir pith, glyricidia leaves and pongamia leaves recorded less germination percentage than control. Highest germination percentage was recorded in soil solarization with TP for 30 days (91.1%).

In tobacco, pendimethalin treated plot recorded no germination percentage followed by less germination percentage in control (82.7%) and highest germination percentage in soil solarization with TP for 30 days (89.3%).

4.6 Effect of weed control treatments on growth components of nursery crops

4.6.1 Root length (cm)

The observations recorded on root length one week after germination at weekly intervals till four weeks after germination is presented in Tables 4.5a to 4.5f.

Root length differed significantly among the treatments till fourth week after germination in all the nursery.

In finger millet, soil solarization with TP for 30 days recorded more root length (1.69 to 3.46 cm) followed by soil solarization with TP for 15 days (1.54-3.10 cm) till fourth week after germination. The least root length is recorded in control (1.26 to 2.26 cm) compared to all other treatments.

In paddy, black polyethylene for 30 days (1.50-5.50 cm) differed significantly with soil solarization with TP for 30 days (2.37-7.03 cm) till fourth week after germination. Hand weeding at 20 DAS recorded less root length (1.16 to 5.83 cm) than soil solarization with TP for 15 days (2.37 to 7.03 cm) on third and fourth week after germination (WAG).

In chilli, soil solarization with TP for 30 days recorded more root length (2.40 to 7.00 cm) followed by soil solarization with TP for 15 days (1.88 to 6.20 cm).

Table 4.5a Effect of weed control treatments on root length (cm), root vigour, shoot length (cm), shoot vigour and plant height (cm) at weekly intervals in finger millet nursery.

Treatments	Week after germination																			
	Root length (cm)				Root vigour				Shoot length (cm)				Shoot vigour				Plant height (cm)			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
T_1 : Soil solarization 15 days TP	1.54 (1.88)	2.14 (4.16)	2.74 (7.08)	3.10 (9.16)	1.48 (1.17)	2.05 (3.79)	2.63 (6.44)	2.97 (8.34)	2.14 (4.10)	2.61 (6.36)	3.13 (9.36)	3.33 (10.66)	2.05 (3.74)	2.50 (5.79)	2.99 (8.51)	3.18 (9.69)	3.40 (11.16)	4.03 (15.83)	4.74 (22.00)	5.14 (26.00)
T_2 : Soil solarization 30 days TP	1.69 (2.40)	2.37 (5.16)	2.97 (8.33)	3.46 (11.50)	1.64 (2.21)	2.28 (4.76)	2.85 (7.68)	3.32 (10.61)	2.20 (4.34)	2.90 (7.93)	3.38 (11.00)	3.64 (12.83)	2.12 (4.03)	2.79 (7.32)	3.26 (10.11)	3.50 (11.80)	3.85 (12.33)	4.23 (17.46)	4.96 (24.16)	5.42 (28.96)
T_3 : Soil solarization 15 days BP	1.53 (1.85)	1.85 (3.00)	2.51 (5.86)	2.93 (8.16)	1.44 (1.58)	1.74 (3.33)	2.35 (5.01)	2.73 (7.02)	1.96 (3.36)	2.37 (5.16)	2.97 (8.33)	3.10 (19.16)	1.83 (2.89)	2.21 (4.44)	2.78 (7.16)	2.89 (7.88)	3.05 (8.33)	3.91 (14.83)	4.58 (20.50)	4.86 (23.16)
T_4 : Soil solarization 30 days BP	1.55 (1.92)	2.08 (3.83)	2.61 (6.36)	3.29 (10.33)	1.47 (1.66)	1.95 (2.23)	2.45 (5.53)	3.07 (8.98)	2.12 (4.03)	2.48 (5.70)	3.22 (9.90)	3.31 (10.50)	2.00 (3.50)	2.33 (4.95)	3.01 (8.61)	3.09 (9.10)	3.25 (10.16)	4.01 (15.66)	4.67 (21.33)	5.00 (24.56)
T_5 : Mulching with coir pith at 5 t/ha	1.40 (1.83)	1.65 (2.63)	2.39 (5.25)	2.59 (6.33)	1.37 (1.38)	1.67 (2.23)	2.31 (4.46)	2.70 (5.38)	1.74 (3.00)	2.10 (4.76)	2.65 (7.66)	2.82 (8.00)	1.74 (2.41)	2.13 (3.94)	2.65 (6.84)	2.70 (6.82)	2.69 (7.80)	3.36 (12.96)	4.47 (19.50)	4.73 (19.40)
T_6 : Mulching with Pongamia leaves at 5 t/ha	1.35 (1.81)	1.52 (2.50)	2.28 (5.00)	2.50 (5.60)	1.29 (1.54)	1.59 (2.13)	2.30 (4.30)	2.65 (5.10)	1.69 (2.83)	1.98 (4.58)	2.61 (7.50)	2.71 (7.80)	1.70 (2.35)	2.10 (3.85)	2.59 (6.75)	2.65 (6.70)	2.51 (7.30)	3.29 (12.85)	4.43 (19.16)	4.69 (19.31)
T_7 : Mulchng with glyricidia leaves at 5 t/ha	1.32 (1.80)	1.55 (2.56)	2.27 (4.40)	2.45 (5.00)	1.21 (1.53)	1.58 (2.03)	2.22 (4.20)	2.52 (4.90)	1.68 (2.65)	1.95 (4.39)	2.60 (7.45)	2.75 (7.50)	1.67 (2.29)	2.08 (3.70)	2.53 (6.65)	2.60 (6.56)	2.52 (7.35)	3.27 (12.80)	4.37 (18.66)	4.70 (19.35)
T_8 : Pendimethalin 1 kg ai/ha	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)
T_9 : Unweeded control	1.26 (1.10)	1.41 (1.50)	2.21 (4.66)	2.26 (4.86)	1.19 (0.92)	1.32 (1.26)	2.10 (3.94)	2.16 (3.94)	1.71 (2.46)	1.91 (3.30)	2.54 (6.00)	2.61 (6.33)	1.60 (2.80)	1.98 (2.67)	2.35 (5.07)	2.51 (5.35)	2.35 (5.06)	3.13 (9.33)	4.33 (18.33)	4.52 (20.00)
T_{10} : Hand weeding at 20 DAS	1.30 (1.46)	1.46 (1.66)	2.54 (6.66)	2.97 (8.33)	1.20 (1.29)	1.37 (1.41)	2.48 (5.65)	2.74 (7.07)	1.74 (2.37)	1.99 (3.31)	3.02 (8.66)	3.18 (9.66)	1.62 (2.14)	1.62 (2.45)	2.85 (7.50)	2.79 (8.20)	2.48 (5.70)	3.48 (11.66)	4.61 (20.80)	4.91 (23.60)
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.04	0.09	0.08	0.11	0.04	0.08	0.07	0.10	0.07	0.07	0.05	0.07	0.69	0.06	0.05	0.07	0.11	0.08	0.07	0.07
C.D. at 0.05	0.14	0.28	0.25	0.34	0.13	0.26	0.22	0.31	0.21	0.21	0.17	0.22	0.20	0.19	0.16	0.20	0.34	0.25	0.21	0.21

* = Significant at 5%; TP = Transparent polyethylene sheet; BP : Black polyethylene sheet; Figures in parantheses indicate original values.

Pendimethalin at 1 kg a.i./ha recorded less root length (1.1 to 5.06 cm) till fourth WAG compared to mulching with coir pith.

In tomato, unweeded control recorded least root length (1.50to 5.76 cm) as compared to all other treatments. Soil solarization with TP for 30 days recorded more root length (3.06 to 9.26 cm).

In capsicum, more root length was recorded in soil solarization with TP for 30 days (2.90 to 8.60 cm). Hand weeding at 20 DAS recorded more root length (5.33 to 6.33 cm) compared to soil solarization with BP for 15 days (5.30 to 6.30 cm) on third and fourth WAG.

In tobacco, unweeded control recorded less root length (1.26 to 1.63 cm) whereas more root length was recorded in soil solarization with TP for 30 days (1.47 to 2.20 cm) till fourth WAG.

4.6.2 Root vigour

The observations recorded on root vigour one WAG at weekly intervals till fourth WAG is presented in Tables 4.5a to 4.5f.

In finger millet, soil solarization with TP for 30 days recorded more root vigour (1.64 to 3.32) till fourth WAG.

Table 4.5b Effect of weed control treatments on root length (cm), root vigour, shoot length (cm), shoot vigour and plant height (cm) at weekly intervals in paddy nursery.

Treatments	Week after germination																			
	Root length (cm)				Root vigour				Shoot length (cm)				Shoot vigour				Plant height (cm)			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
T_1 : Soil solarization 15 days TP	1.80	3.58	4.80	6.00	1.53	3.29	4.41	5.27	1.90	5.60	7.63	9.40	2.90	5.14	7.01	8.64	5.63	7.73	11.06	13.67
T_2 : Soil solarization 30 days TP	2.37	4.20	5.66	7.03	2.20	4.18	5.26	6.53	3.73	6.00	8.36	11.50	3.46	5.63	7.77	10.69	6.43	8.96	12.23	15.16
T_3 : Soil solarization 15 days BP	1.36	2.66	3.96	5.30	1.17	2.00	3.40	4.27	2.63	4.76	5.76	8.03	2.26	4.09	4.95	6.90	4.93	7.03	9.40	12.30
T_4 : Soil solarization 30 days BP	1.50	2.80	4.50	5.50	1.38	2.47	3.99	4.89	2.86	5.30	6.50	8.83	2.54	4.71	5.78	7.85	5.23	7.50	10.03	12.66
T_5 : Mulching with coir pith at 5 t/ha	1.36	2.16	3.51	4.96	1.21	1.83	2.94	4.27	2.16	4.23	5.50	6.23	1.94	3.90	4.72	5.41	4.63	6.30	8.70	11.70
T_6 : Mulching with Pongamia leaves at 5 t/ha	1.44	2.03	3.50	4.83	1.18	1.74	2.83	4.10	2.09	4.09	5.49	6.20	1.81	3.80	4.61	5.40	4.50	5.93	8.63	12.30
T_7 : Mulchng with glyricidia leaves at 5 t/ha	1.41	1.93	3.41	4.80	1.19	1.73	2.81	3.91	2.07	4.01	5.49	6.15	1.80	3.71	4.59	5.35	4.52	5.79	8.53	12.03
T_8 : Pendimethalin 1 kg ai/ha	1.30	1.27	3.33	4.70	0.87	1.55	2.73	3.85	2.10	3.63	5.36	6.05	1.71	2.97	4.39	5.16	4.10	5.43	8.26	11.90
T_9 : Unweeded control	1.26	2.00	3.23	4.63	1.04	1.65	2.67	3.73	1.96	3.70	5.30	5.93	1.62	3.23	4.29	4.92	3.70	5.26	8.20	10.96
T_{10} : Hand weeding at 20 DAS	1.16	1.96	4.30	5.83	0.97	1.64	3.61	4.89	2.03	3.60	6.00	8.43	1.93	2.99	5.03	7.08	3.63	5.16	9.66	12.37
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.09	0.12	0.10	0.18	0.08	0.11	0.08	0.15	0.07	0.45	0.09	0.10	0.06	0.03	0.07	0.10	0.08	0.18	0.21	0.57
C.D. at 0.05	0.29	0.37	0.30	0.54	0.25	0.33	0.26	0.44	0.20	0.13	0.27	0.32	0.18	0.10	0.23	0.30	0.26	0.55	0.64	1.70

* = Significant at 5%; TP = Transparent polyethylene sheet; BP : Black polyethylene sheet

Mulching with coir pith pongamia and glyricidia leaves did not differ significantly with the control.

In paddy, BP in general recorded less root vigour than TP. Least root vigour was recorded in control (1.04 to 3.73) and differed significantly with soil solarization with TP for 15 days (1.53 to 5.27) till fourth WAG.

In chilli, soil solarization with TP for 15 days (1.65 to 5.45) recorded less root vigour than soil solarization with TP for 30 days (2.16 to 6.29). Hand weeding at 20 DAS recorded more root vigour (3.86 to 4.66) than control (3.22 to 4.16) on third and fourth WAG.

In tomato, unweeded control recorded less root vigour (1.22 to 4.78). Soil solarization with TP for 15 days recorded less root vigour (2.37 to 8.15) than soil solarization with TP for 30 days (2.75 to 8.34) till fourth WAG.

In capsicum, mulching with coir pith, pongamia and glyricidia leaves did not differ significantly over control. Soil solarization with TP for 30 days recorded more root vigour (2.63 to 5.45) than pendimethalin at 1 kg a.i./ha (1.30 to 4.12) till fourth WAG.

In tobacco, more root vigour was recorded in soil solarization with TP for 30 days (1.40 to 2.09) till fourth

Table 4.5c Effect of weed control treatments on root length (cm), root vigour, shoot length (cm), shoot vigour and plant height (cm) at weekly intervals in chilli nursery.

Treatments	Week after germination																			
	Root length (cm)				Root vigour				Shoot length (cm)				Shoot vigour				Plant height (cm)			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
T_1 : Soil solarization 15 days TP	1.88	2.65	5.00	6.20	1.65	2.32	4.40	5.45	2.72	5.43	8.10	9.50	2.39	4.70	6.54	8.35	3.66	6.43	9.33	11.63
T_2 : Soil solarization 30 days TP	2.40	3.08	5.83	7.00	2.16	2.77	5.24	6.29	3.41	6.50	9.50	11.03	3.06	6.02	8.55	9.92	4.50	6.60	10.83	12.96
T_3 : Soil solarization 15 days BP	1.46	2.28	4.63	5.63	1.22	1.93	3.93	4.78	2.44	4.96	7.20	8.63	2.07	4.02	6.11	7.33	3.43	5.80	8.70	10.96
T_4 : Soil solarization 30 days BP	1.52	2.35	4.72	5.70	1.31	2.01	4.03	4.89	2.51	5.16	8.00	9.30	2.15	4.43	6.87	7.96	3.63	6.26	9.00	11.36
T_5 : Mulching with coir pith at 5 t/ha	1.35	2.20	4.50	5.40	1.06	1.85	3.77	4.54	2.08	4.36	6.43	7.96	1.82	3.60	5.46	6.76	2.87	5.63	8.43	10.63
T_6 : Mulching with Pongamia leaves at 5 t/ha	1.33	2.17	4.33	5.36	1.01	1.82	3.63	4.50	2.04	4.16	6.40	8.00	1.74	3.49	5.37	6.74	2.70	5.70	8.26	10.46
T_7 : Mulchng with glyricidia leaves at 5 t/ha	1.25	2.09	4.16	5.26	1.02	1.75	3.54	4.47	2.01	4.10	6.33	8.10	1.70	3.48	5.31	6.72	2.77	5.76	8.23	10.50
T_8 : Pendimethalin 1 kg ai/ha	1.19	1.58	4.00	5.06	0.98	1.36	3.31	4.19	1.73	5.16	6.06	7.66	1.56	3.42	5.29	6.39	2.36	4.63	7.06	9.83
T_9 : Unweeded control	0.96	1.53	3.80	4.96	0.80	1.30	3.22	4.16	1.63	3.96	5.83	7.50	1.43	3.40	5.03	6.29	2.30	4.56	7.00	9.31
T_{10} : Hand weeding at 20 DAS	1.02	1.60	4.83	5.83	1.00	1.32	3.86	4.66	1.70	4.00	7.33	9.00	1.46	3.25	5.86	7.20	2.20	4.60	9.00	11.00
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.14	0.27	0.42	0.65	0.11	0.23	0.35	0.56	0.16	0.39	0.72	0.67	0.15	0.33	0.53	0.57	0.30	0.33	0.57	0.61
C.D. at 0.05	0.41	0.81	1.27	1.93	0.35	0.69	1.06	1.66	0.49	1.15	1.51	1.47	0.44	0.98	1.58	1.70	0.91	0.99	1.71	1.28

* = Significant at 5%; TP = Transparent polyethylene sheet; BP : Black polyethylene sheet

WAG. Hand weeding at 20 DAS recorded more root vigour (1.64 to 1.80) as compared to soil solarization with BP for 15 days (1.57 to 1.76) on third and fourth WAG.

4.6.3 **Shoot length (cm)**

The observation recorded on shoot length one WAG at weekly intervals till fourth WAG is presented in Tables 4.5a to 4.5f.

Shoot length differed significantly among the treatments in all the nursery beds.

In finger millet, soil solarization with TP for 30 days (2.20 to 3.64 cm) recorded more shoot length, followed by soil solarization with TP for 15 days (2.14 to 3.33 cm). Hand weeding at 20 DAS recorded more shoot length (3.02 to 3.18 cm) than control (2.54 to 2.61 cm) on third and fourth WAG.

In paddy, unweeded control recorded less shoot length (1.96 to 5.93 cm) as compared to all other treatments till fourth WAG. Soil solarization with TP for 30 days (3.73 to 11.5 cm) followed by soil solarization with TP 15 days (1.9 to 9.4 cm).

In chilli, soil solarization with BP for 30 days recorded less shoot length (2.51 to 9.30 cm) and differed significantly with TP for 30 days (3.41 to 11.03 cm). Hand

Table 4.5d Effect of weed control treatments on root length (cm), root vigour, shoot length (cm), shoot vigour and plant height (cm) at weekly intervals in tomato nursery.

Treatments	Week after germination																			
	Root length (cm)				Root vigour				Shoot length (cm)				Shoot vigour				Plant height (cm)			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
T_1 : Soil solarization 15 days TP	2.66	5.30	7.83	8.53	2.37	4.71	6.81	8.15	5.16	7.93	12.03	13.70	4.58	7.11	10.70	12.19	6.63	9.83	13.83	18.00
T_2 : Soil solarization 30 days TP	3.06	5.70	8.36	9.26	2.75	5.13	7.53	8.34	6.25	8.83	13.16	15.00	5.62	7.95	11.85	13.50	8.33	10.83	14.66	19.16
T_3 : Soil solarization 15 days BP	1.95	4.96	6.63	7.70	1.66	4.11	5.50	6.38	4.96	5.96	9.76	12.33	4.11	4.92	8.10	10.23	5.73	8.70	12.50	16.50
T_4 : Soil solarization 30 days BP	2.16	5.06	7.40	8.30	1.83	4.27	6.03	7.05	5.76	6.33	10.83	13.20	4.89	5.38	9.20	11.08	6.03	9.36	11.30	17.33
T_5 : Mulching with coir pith at 5 t/ha	1.96	4.40	6.23	6.83	1.56	3.50	4.69	4.94	4.50	6.13	10.30	12.16	3.68	4.61	7.85	10.31	5.30	8.30	11.96	15.13
T_6 : Mulching with Pongamia leaves at 5 t/ha	1.93	4.39	6.06	6.46	1.62	3.42	4.59	4.92	4.23	6.06	9.83	12.30	3.59	4.59	7.73	10.35	5.43	8.43	12.06	15.03
T_7 : Mulchng with glyricidia leaves at 5 t/ha	1.92	4.38	5.73	6.03	1.52	3.43	4.55	4.89	3.41	5.70	9.79	12.00	3.50	4.52	7.70	10.36	5.36	8.36	12.03	14.96
T_8 : Pendimethalin 1 kg ai/ha	1.56	3.19	5.43	6.00	1.24	2.48	4.34	4.80	4.34	5.36	9.10	11.66	3.63	4.21	6.96	10.33	5.96	7.90	11.93	14.63
T_9 : Unweeded control	1.50	3.03	5.30	5.76	1.22	2.34	4.39	4.78	3.19	5.30	8.90	11.33	3.60	4.14	6.92	10.20	5.03	7.83	11.90	13.20
T_{10} : Hand weeding at 20 DAS	1.49	3.08	6.96	7.33	1.30	2.30	5.77	6.03	5.28	5.30	11.33	13.70	3.72	4.39	9.40	10.36	5.30	8.10	13.60	17.00
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.20	0.46	0.39	0.44	0.17	0.39	0.36	0.38	0.36	0.30	0.37	0.38	0.31	0.25	0.32	0.32	0.34	0.40	0.36	0.59
C.D. at 0.05	0.60	1.37	1.18	1.32	0.51	1.16	1.09	1.13	1.08	0.89	1.12	1.15	0.92	0.76	0.93	0.95	1.01	1.22	1.07	1.74

* = Significant at 5%; TP = Transparent polyethylene sheet; BP : Black polyethylene sheet

weeding at 20 DAS recorded more shoot length (7.33 to 9.00 cm) than soil solarization with BP (7.20 to 8.63 cm) for 15 days on third and fourth WAG.

In tomato, soil solarization with TP for 30 days recorded more shoot length (6.25 to 15 cm) followed by soil solarization with TP for 15 days (5.16 to 13.70 cm). Pendimethalin at 1 kg a.i./ha more shoot length (4.34 to 11.66) than control (3.19 to 11.33).

In capsicum, soil solarization with BP for 30 days (2.83 to 9.66 cm) recorded more shoot length than soil solarization with BP for 15 days (3.63 to 10.33 cm). Unweeded control (1.90 to 8.00 cm) recorded less shoot length compared to all other treatments.

In tobacco, soil solarization for 30 days TP recorded more shoot length (1.72 to 2.42 cm) followed by soil solarization for 15 days TP (1.66 to 2.33 cm), pendimethalin at 1 kg a.i./ha recorded no shoot length till 42 DAS.

4.6.4 Shoot vigour

The data on shoot vigour recorded one WAG at weekly intervals till fourth WAG is presented in Tables 4.5a to 4.5f.

Shoot vigour differed significantly among the treatments in all the nursery.

Table 4.5e Effect of weed control treatments on root length (cm), root vigour, shoot length (cm), shoot vigour and plant height (cm) at weekly intervals in capsicum nursery.

Treatments	Week after germination																			
	Root length (cm)				Root vigour				Shoot length (cm)				Shoot vigour				Plant height (cm)			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
T_1 : Soil solarization 15 days TP	2.40	3.16	5.76	7.36	2.08	2.74	5.01	6.40	3.63	6.33	9.83	10.33	3.15	5.50	8.55	8.98	4.10	7.96	10.70	12.36
T_2 : Soil solarization 30 days TP	2.90	3.76	6.60	8.60	2.63	3.42	6.00	5.45	4.10	7.50	10.33	12.03	3.72	6.82	9.41	10.94	4.96	8.40	11.50	13.00
T_3 : Soil solarization 15 days BP	1.96	2.76	5.30	6.30	1.64	2.32	4.46	5.29	2.60	5.63	8.96	9.30	2.18	4.72	7.52	7.80	3.40	6.96	9.76	11.40
T_4 : Soil solarization 30 days BP	2.10	3.03	5.63	6.50	1.78	2.57	4.76	5.52	2.83	5.93	9.33	9.66	2.40	5.03	7.77	8.21	3.83	7.60	10.30	12.16
T_5 : Mulching with coir pith at 5 t/ha	1.63	2.63	5.06	5.96	1.36	1.90	4.19	5.00	2.40	5.40	8.70	8.91	1.99	4.46	6.96	7.35	3.26	6.53	9.06	11.30
T_6 : Mulching with Pongamia leaves at 5 t/ha	1.53	2.26	5.03	5.63	1.32	1.87	4.17	4.64	2.36	5.36	8.36	8.76	1.96	4.28	6.94	7.27	2.90	6.30	8.96	10.70
T_7 : Mulching with glyricidia leaves at 5 t/ha	1.51	2.16	4.93	5.60	1.30	1.79	4.19	4.67	2.30	5.10	8.30	8.81	1.93	4.21	5.83	7.32	2.83	6.10	8.76	10.86
T_8 : Pendimethalin 1 kg ai/ha	1.60	1.76	4.70	5.03	1.30	1.44	3.85	4.12	1.96	5.08	8.16	8.30	1.60	4.12	6.69	6.80	2.50	5.46	8.26	9.56
T_9 : Unweeded control	1.40	1.70	4.63	4.96	1.17	1.42	3.88	4.16	1.90	5.03	7.66	8.00	1.59	4.26	6.43	6.71	2.30	5.30	8.25	9.70
T_{10} : Hand weeding at 20 DAS	1.56	1.63	5.33	6.33	1.46	1.34	4.42	5.25	2.10	5.30	9.00	9.33	1.74	4.39	7.43	7.74	2.30	5.36	9.33	11.66
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.10	0.20	0.32	0.22	0.08	0.17	0.27	0.18	0.23	0.32	0.34	0.11	0.19	0.27	0.54	0.09	0.37	0.40	0.17	0.16
C.D. at 0.05	0.29	0.60	0.95	0.67	0.26	0.52	0.81	0.56	0.70	0.96	1.03	0.35	0.52	0.82	1.60	0.29	1.12	1.20	0.51	0.49

* = Significant at 5%; TP = Transparent polyethylene sheet; BP : Black polyethylene sheet

In finger millet, soil solarization with TP for 30 days recorded more shoot vigour (2.12 to 3.50) followed by soil solarization with TP for 15 days (2.05 to 3.18) till fourth WAG. Mulching with coir pith, pongamia leaves and glyricicia leaves did not differ significantly over control.

In paddy, unweeded control recorded least shoot vigour (1.62 to 4.92) compared to all other treatments. soil solarization with BP for 30 days recorded less shoot vigour (2.54-7.85) and differed significantly over soil solarization with TP for 30 days (3.46 to 10.69).

In chilli, pendimethalin at 1 kg a.i./ha recorded more shoot vigour (1.46 to 6.39) compared to control (1.43 to 6.29) till fourth WAG. Soil solarization with TP for 30 days recorded highest shoot vigour (3.06 to 9.92).

In tomato, soil solarization with TP for 30 days recorded more shoot vigour (5.62 to 13.5) followed by soil solarization TP for 15 days (4.58 to 12.19). Hand weeding at 20 DAS recorded more shoot vigour (9.4 to 10.36) compared to pendimethalin (6.96 to 10.33) on third and fourth WAG.

In capsicum, hand weeding at 20 DAS recorded less shoot vigour (7.43 to 7.74) compared to soil solarization with BP for 15 days (7.52 to 7.80) and third and fourth WAG. Soil solarization with TP for 30 days recorded more shoot vigour (3.72 to 10.94).

Table 4.5f Effect of weed control treatments on root length (cm), root vigour, shoot length (cm), shoot vigour and plant height (cm) at weekly intervals in tobacco nursery.

Treatments	Week after germination																			
	Root length (cm)				Root vigour				Shoot length (cm)				Shoot vigour				Plant height (cm)			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
T_1 : Soil solarization 15 days TP	1.35 (1.33)	1.67 (2.30)	1.78 (2.70)	2.04 (3.70)	1.11 (1.53)	1.57 (3.29)	1.67 (4.41)	1.91 (5.27)	1.66 (2.26)	1.87 (3.03)	2.06 (3.76)	2.33 (4.93)	1.56 (1.94)	1.76 (2.60)	1.93 (3.23)	2.17 (4.23)	2.13 (4.10)	2.38 (5.16)	2.62 (6.50)	2.86 (7.73)
T_2 : Soil solarization 30 days TP	1.47 (1.66)	1.72 (2.50)	1.99 (3.50)	2.20 (14.36)	1.40 (2.20)	1.64 (4.18)	1.89 (5.26)	2.09 (6.53)	1.72 (2.50)	1.98 (3.43)	2.20 (4.36)	2.42 (5.43)	1.63 (2.19)	1.88 (3.05)	2.09 (3.88)	2.30 (4.83)	2.30 (4.83)	2.47 (5.66)	2.73 (7.00)	2.96 (8.33)
T_3 : Soil solarization 15 days BP	1.30 (1.20)	1.56 (1.96)	1.69 (2.36)	1.89 (3.10)	1.22 (1.17)	1.46 (2.00)	1.57 (3.40)	1.76 (4.27)	1.56 (1.96)	1.69 (2.36)	1.78 (2.70)	2.06 (3.76)	1.46 (1.64)	1.57 (1.98)	1.66 (2.26)	1.91 (3.15)	1.93 (3.26)	2.11 (3.96)	2.46 (5.60)	2.60 (6.30)
T_4 : Soil solarization 30 days BP	1.36 (1.36)	1.63 (2.16)	1.76 (2.63)	2.03 (3.63)	1.28 (1.38)	1.52 (2.47)	1.65 (3.96)	1.89 (4.89)	1.63 (2.16)	1.85 (2.96)	2.03 (3.63)	2.26 (4.63)	1.52 (1.83)	1.73 (2.51)	1.84 (3.08)	2.10 (3.93)	2.03 (3.63)	2.26 (4.63)	2.60 (6.50)	2.72 (6.96)
T_5 : Mulching with coir pith at 5 t/ha	1.27 (1.13)	1.44 (1.60)	1.68 (2.30)	1.76 (2.96)	1.19 (1.18)	1.34 (1.83)	1.53 (2.94)	1.71 (4.21)	1.41 (1.50)	1.61 (2.10)	1.70 (2.43)	2.02 (3.63)	1.31 (1.22)	1.48 (1.71)	1.57 (1.99)	1.71 (3.04)	1.72 (2.50)	1.95 (3.63)	2.40 (5.03)	2.49 (5.96)
T_6 : Mulching with Pongamia leaves at 5 t/ha	1.25 (1.06)	1.43 (1.56)	1.65 (2.16)	1.75 (2.86)	1.17 (1.15)	1.33 (1.73)	1.52 (2.81)	1.69 (4.19)	1.38 (1.45)	1.63 (2.15)	1.69 (2.40)	2.00 (3.60)	1.25 (1.18)	1.39 (1.67)	1.56 (2.07)	1.72 (2.98)	1.69 (2.10)	1.93 (2.96)	2.35 (4.96)	2.39 (5.63)
T_7 : Mulchng with glyricidia leaves at 5 t/ha	1.23 (1.16)	1.41 (1.50)	1.69 (2.10)	1.76 (2.83)	1.18 (1.17)	1.31 (1.55)	1.49 (2.75)	1.68 (4.15)	1.37 (1.40)	1.65 (2.20)	1.65 (2.35)	1.95 (3.53)	1.28 (1.16)	1.35 (1.63)	1.55 (1.99)	1.73 (2.91)	1.65 (2.05)	1.90 (2.90)	2.38 (4.90)	2.35 (5.66)
T_8 : Pendimethalin 1 kg ai/ha	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)
T_9 : Unweeded control	1.26 (1.10)	1.37 (1.40)	1.48 (1.70)	1.63 (2.16)	1.18 (1.04)	1.28 (1.65)	1.37 (2.67)	1.50 (1.77)	1.34 (1.30)	1.49 (1.96)	1.56 (2.30)	1.93 (3.26)	1.21 (0.98)	1.45 (1.61)	1.54 (1.88)	1.68 (2.67)	1.50 (1.36)	1.70 (2.36)	2.18 (4.30)	2.30 (5.30)
T_{10} : Hand weeding at 20 DAS	1.29 (1.16)	1.41 (1.50)	1.78 (2.70)	1.96 (3.33)	1.20 (0.97)	1.31 (1.69)	1.64 (3.61)	1.80 (2.75)	1.39 (1.43)	1.48 (1.93)	1.67 (2.26)	1.94 (3.30)	1.29 (1.17)	1.44 (1.58)	1.65 (1.85)	1.88 (2.70)	1.56 (1.96)	1.72 (2.45)	2.51 (5.93)	2.72 (7.33)
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.02	0.03	0.05	0.04	0.05	0.02	0.04	0.03	0.03	0.31	0.06	0.06	0.03	0.02	0.06	0.05	0.07	0.07	0.12	0.05
C.D. at 0.05	0.05	0.09	0.16	0.13	0.16	0.08	0.14	0.11	0.11	0.93	0.19	0.18	0.11	0.08	0.19	0.16	0.22	0.22	0.37	0.15

* = Significant at 5%; TP = Transparent polyethylene sheet; BP : Black polyethylene sheet; Figures in parantheses indicate original values.

In tobacco, unweeded control recorded less shoot vigour (1.21 to 1.68) as compared to all other treatments. Whereas, more shoot vigour was recorded in soil solarization with TP for 30 days (1.63 to 2.30) followed by soil solarization with TP for 15 days (1.56 to 2.17) till fourth WAG.

4.6.5 Plant height (cm)

The observations recorded on plant height one WAG at weekly intervals till fourth WAG is presented in Tables 4.5a to 4.5f.

Plant height differed significantly among the treatments in all the nursery.

In finger millet, soil solarization with BP for 30 days (3.2 to 5.0 cm) recorded less plant height which differed significantly with soil solarization with TP for 30 days (3.2 to 5.4 cm) on second to fourth WAG. Mulching with coir pith, pongamia leaves and glyricidia leaves did not differ significantly with each other.

In paddy, soil solarization with BP for 30 days recorded less plant height (5.23 to 12.66 cm) and differed significantly in soil solarization with TP for 30 days (6.43 to 15.16 cm). Pendimethalin at 1 kg a.i./ha recorded less plant height (4.1 to 11.9 cm) than control (3.7 to 10.96 cm) till fourth WAG.

In chilli, unweeded control recorded less plant height (2.3 to 9.31 cm) as compared to all other treatments. Soil solarization with TP for 30 days recorded more plant height (4.5 to 12.96 cm) followed by soil solarization with TP for 15 days (3.6 to 11.63 cm).

In tomato, pendimethalin at 1 kg a.i./ha recorded more plant height (5.96 to 14.63 cm) than control (5.03 to 13.2 cm) till fourth WAG. Hand weeding at 20 DAS recorded more plant (13.6 to 17.0 cm) on third and fourth WAG compared to BP for 30 days (12.5 to 16.5 cm).

In capsicum, soil solarization with TP for 30 days recorded more plant height (4.96 to 13.0 cm) and differed significantly in soil solarization with BP for 30 days (3.8 to 12.1 cm). Mulching with coir pith, pongamia leaves and glyricidia leaves did not differ significantly with the control.

In tobacco, unweeded control recorded less plant height (1.5 to 2.3 cm) as compared to all other treatments. More plant height was recorded in soil solarization with TP for 30 days (2.3 to 2.96 cm) followed by soil solarization with TP for 15 days (2.13 to 2.86 cm) till fourth WAG.

4.7 Plant dry weight (g/plant)

The observations recorded on dry weight (g/plant), one WAG at weekly intervals till fourth WAG is presented in Tables 4.6 and Fig. 4.3a and 4.3b.

Dry weight per plant differed significantly among the treatments till fourth WAG in all the crops.

In finger millet, soil solarization with TP for 30 days recorded more dry matter production (1.58 to 2.84 g/plant) followed by soil solarization with TP for 15 days (1.48 to 2.62 g/plant) till fourth WAG. Mulching with coir pith, pongamia leaves and glyricidia leaves did not differ significantly with the control.

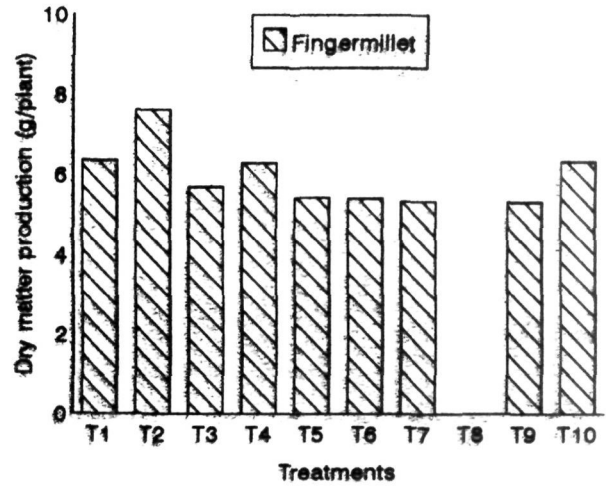
In paddy, soil solarization with BP for 30 days recorded less dry matter production (0.66 to 5.63 g) and differed significantly with soil solarization with TP for 30 days (1.16 to 6.43 g/plant). Pendimethalin treated plot recorded more dry matter production (0.41 to 4.19 g/plant) compared to control (0.40 to 4.16 g/plant).

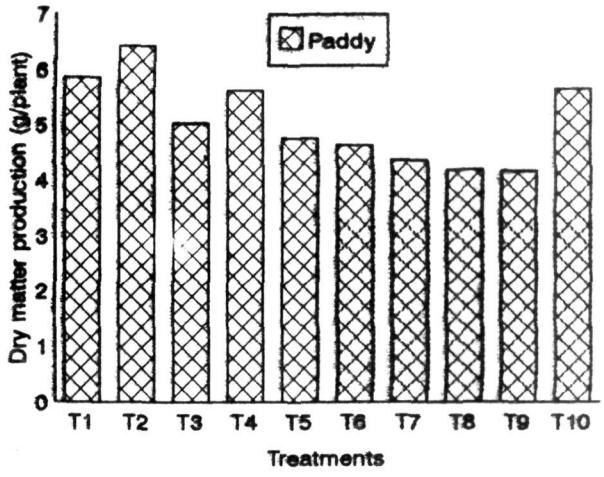
In chilli, unweeded control recorded less dry matter production (0.30 to 3.06 g/plant) as compared to all other treatments till fourth WAG. Hand weeding at 20 DAS recorded more dry matter production (3.66 to 4.73 g/plant) on third and fourth WAG compared to soil solarization with BP for 15 days (3.53 to 4.26 g/plant).

Table 4.6 Effect ofweed control treatments on dry matter production (g/plant) at weekly intervals in nursery crops.

Treatments	Week after germination																							
	Dry matter production (g/plant)																							
	Finger millet				Paddy				Chilli				Tomato				Capsicum				Tobacco			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
T_1 : Soil solarization 15 days TP	1.48 (1.12)	1.76 (2.63)	2.36 (1.63)	2.62 (6.36)	0.83	2.63	4.56	5.86	1.16	1.93	4.03	4.93	1.43	2.97	6.30	7.96	0.96	1.63	3.96	5.06	1.29 (1.16)	1.45 (1.63)	2.09 (3.96)	2.33 (4.96)
T_2 : Soil solarization 30 days TP	1.58 (1.45)	2.02 (3.61)	2.48 (5.70)	2.84 (7.63)	1.16	3.00	5.06	6.43	1.26	2.30	4.60	6.00	1.70	3.56	7.16	8.36	1.16	1.99	4.12	5.83	1.35 (1.33)	1.57 (1.98)	2.19 (4.33)	2.51 (5.83)
T_3 : Soil solarization 15 days BP	1.37 (0.72)	1.59 (2.03)	2.25 (4.60)	2.48 (5.70)	0.55	1.93	3.96	5.03	0.70	1.03	3.53	4.26	1.00	3.10	5.36	7.03	0.40	1.03	3.06	4.36	1.08 (0.70)	1.20 (0.97)	1.87 (3.03)	2.12 (4.03)
T_4 : Soil solarization 30 days BP	1.44 (0.83)	1.67 (2.29)	2.33 (4.96)	2.60 (6.30)	0.66	2.29	4.26	5.63	0.96	1.63	3.96	4.63	1.16	3.16	5.96	7.43	0.63	1.36	3.60	4.83	1.19 (0.93)	1.34 (1.32)	2.02 (3.60)	2.23 (4.50)
T_5 : Mulching with coir pith at 5 t/ha	1.33 (0.68)	1.52 (1.83)	2.16 (4.16)	2.43 (5.43)	0.49	1.61	3.43	4.76	0.63	0.93	3.36	3.90	1.83	2.96	5.26	6.60	0.30	0.86	2.63	4.30	1.06 (0.63)	1.15 (0.86)	1.82 (2.83)	2.11 (3.96)
T_6 : Mulching with Pongamia leaves at 5 t/ha	1.29 (0.67)	1.50 (1.76)	2.11 (3.96)	2.42 (5.40)	0.44	1.50	3.36	4.63	0.56	0.90	3.16	3.63	1.76	2.90	4.96	6.23	0.25	0.80	2.50	3.93	1.04 (0.60)	1.13 (0.80)	1.80 (2.80)	2.08 (3.83)
T_7 : Mulchng with glyricidia leaves at 5 t/ha	1.27 (0.67)	1.49 (1.73)	2.12 (3.93)	2.41 (5.33)	0.45	1.50	3.33	4.36	0.53	0.83	3.10	3.50	1.66	2.76	4.76	6.20	0.25	0.83	2.43	3.83	0.99 (0.50)	1.15 (0.83)	1.79 (2.73)	2.06 (3.80)
T_8 : Pendimethalin 1 kg ai/ha	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.41	1.16	3.30	4.19	0.33	0.60	2.96	3.10	1.63	2.26	4.43	5.76	0.21	0.55	2.30	3.66	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)	0.70 (0.00)
T_9 : Unweeded control	1.20 (0.55)	1.41 (1.50)	2.04 (3.66)	2.40 (5.30)	0.40	1.06	3.23	4.16	0.30	0.63	2.90	3.06	0.60	2.40	4.66	5.66	0.16	0.53	2.17	3.63	0.90 (0.30)	0.99 (0.50)	1.56 (1.96)	1.95 (3.33)
T_{10} : Hand weeding at 20 DAS	1.25 (0.53)	1.37 (1.40)	2.34 (5.00)	2.61 (6.33)	0.41	1.00	4.66	5.66	0.50	0.66	3.66	4.73	0.63	2.50	6.00	6.66	0.07	0.50	3.73	5.00	0.89 (0.30)	1.03 (0.56)	2.03 (3.66)	2.26 (4.66)
F test	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
S.Em ±	0.02	0.03	0.03	0.06	0.07	0.08	0.09	0.13	0.05	0.07	0.15	0.10	0.06	0.15	0.51	0.37	0.08	0.09	0.28	0.26	0.04	0.06	0.05	0.06
C.D. at 0.05	0.69	0.10	0.09	0.18	0.21	0.26	0.28	0.40	0.17	0.21	0.41	0.32	0.19	0.44	1.51	1.12	0.26	0.27	0.85	0.77	0.14	0.19	0.16	0.17

* = Significant at 5 per cent; TP = Transparent polyethylene sheet; BP = Black polyethylene sheet
Figures in parentheses indicate original values





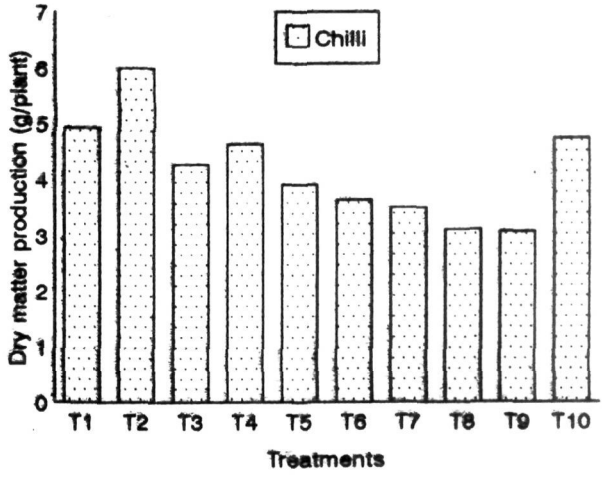


Fig.4.3a: Drymatter production (g/plant) at fourth week after germination in fingermillet, paddy and chilli nursery as influenced by weed control treatments

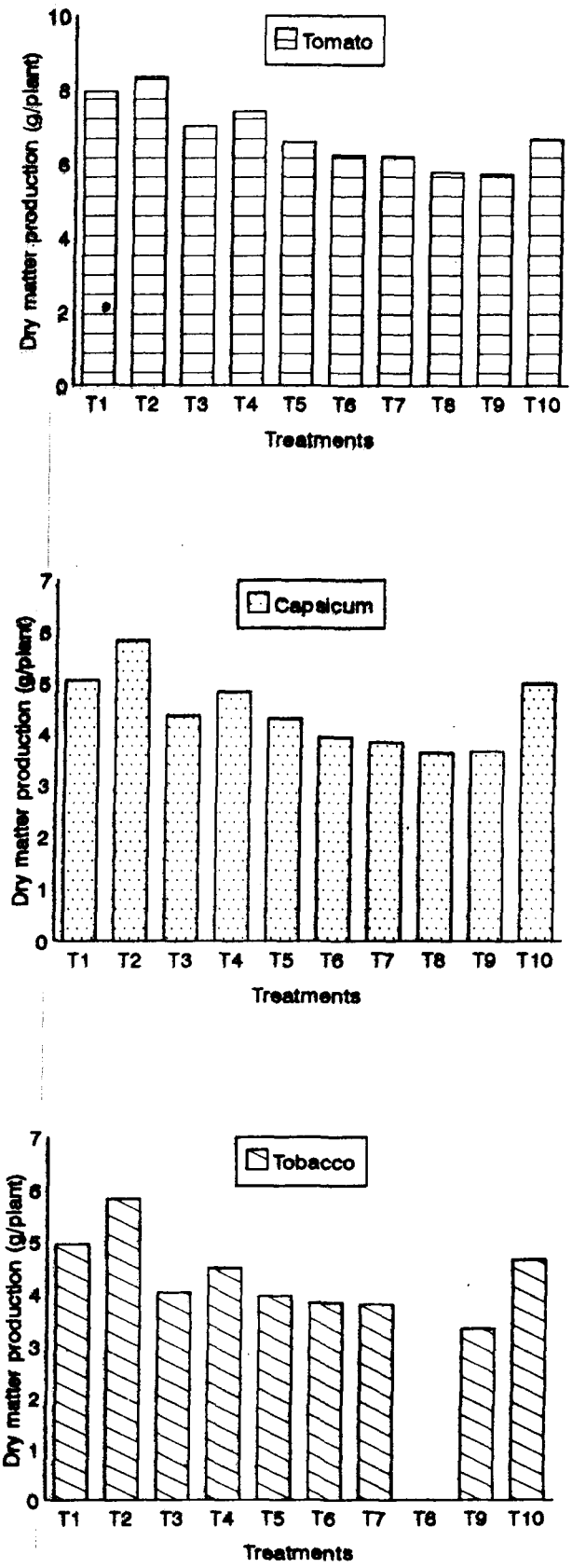


Fig.4.3b: Drymatter production (g/plant) at fourth week after germination in tomato, capsicum and tobacco nursery as influenced by weed control treatments.

In tomato, pendimethalin at 1 kg a.i./ha recorded more dry matter production (1.63 to 5.76 g/plant) as compared to control (0.6 to 5.66) till fourth WAG. Soil solarization with TP for 30 days recorded more dry matter production (1.70 to 8.36 g/plant) compared to all other treatments.

In capsicum, soil solarization with BP for 30 days (0.63 to 4.83 g/plant) recorded less dry matter production per plant and differed significantly in soil solarization with TP for 30 days (1.16 to 5.83 g/plant). Hand weeding at 20 DAS recorded more dry matter production (3.73 to 5.0 g/plant) compared to soil solarization with BP for 15 days (3.06 to 4.36 g/plant) on third and fourth WAG.

In tobacco, soil solarization with TP for 30 days recorded more dry matter production (1.35 to 2.51 g/plant) followed by soil solarization with TP for 15 days (1.29 to 2.33 g/plant) till fourth WAG. Mulching with coir pith and pongamia leaves did not differ significantly with control.

4.8 Correlation coefficient values for weed count and weed dry weight with temperature in nursery

Correlation coefficient value (r) for weed count and weed dry weight with temperature in nursery are presented in Table 4.7 at 5 cm and 10 cm soil depths.

Temperature at 5 cm soil depth for 15 days was found to have significantly strong and negative correlation for weed

count (15 DAS) in finger millet (r = -0.891), paddy (r = -0.903), chilli (r = -0.871), tomato (r = -0.922), capsicum (r = -0.910) and tobacco (r = -0.863).

Temperature at 5 cm soil depth for 30 days was found to have significantly strong and negative correlation for weed count (30 DAS) in finger millet (r = -0.931), paddy (r = -0.921), chilli (r = -0.935), tomato (r = -0.895), capsicum (r = -0.931) and tobacco (r = -0.901).

Temperature at 5 cm soil depth for 15 days was found to have significantly strong and negative correlation for weed dry weight (15 DAS) in finger millet (r = -0.879), paddy (r = -0.893), chilli (r = -0.900), tomato (r = -0.931), capsicum (r = -0.921) and tobacco (r = -0.893).

Temperature at 5 cm depth for 30 days was found to have significantly strong and negative correlation for weed dry weight (30 DAS) in finger millet (r = -0.910), paddy (r = -0.902), chilli (r = -0.910), tomato (r = -0.931), capsicum (r = -0.921) and tobacco (r = -0.911).

Temperature at 10 cm soil depth for 15 days was found to have significantly strong and negative correlation for weed count (15 DAS) in finger millet (r = -0.872), paddy (r = -0.893), chilli (r = -0.892), tomato (r = -0.912), capsicum (r = -0.921) and tobacco (r = -0.893).

Table 4.7 Correlation coefficients value (r) for weed count and weed dry weight with temperature in nursery.

Crops	5 cm depth of soil				10 cm depth of soil			
	Temperature at 15 days		Temperature at 30 days		Temperature at 15 days		Temperature at 30 days	
	15 DAS		30 DAS		15 DAS		30 DAS	
	Weed count	Weed dry weight	Weed count	Weed dry weight	Weed count	Weed dry weight	Weed count	Weed dry weight
Finger millet	-0.891**	-0.879**	-0.931**	-0.910**	-0.872**	-0.891**	-0.912**	-0.901**
Paddy	-0.903**	-0.893**	-0.921**	-0.902**	-0.893**	-0.911**	-0.921**	-0.920**
Chilli	-0.871**	-0.900**	-0.935**	-0.910**	-0.892**	-0.910**	-0.901**	-0.973**
Tomato	-0.922**	-0.931**	-0.895**	-0.931**	-0.912**	-0.921**	-0.883**	-0.921**
Capsicum	-0.910**	-0.921**	-0.931**	-0.921**	-0.921**	-0.893**	-0.911**	-0.913**
Tobacco	-0.863**	-0.893**	-0.901**	-0.911**	-0.893**	-0.865**	-0.921**	-0.923**

* = Significant at 5 per cent ** = Significant at 1 per cent

Temperature at 10 cm soil depth for 30 days was found to have significantly strong and negative correlation for weed count (30 DAS) in finger millet (r = -0.912), paddy (r = -0.921), chilli (r = -0.901), tomato (r = -0.883), capsicum (r = -0.911) and tobacco (r = -0.921).

Temperature at 10 cm soil depth for 15 days was found to have significantly strong and negative correlation for weed dry weight (30 DAS) in finger millet (r = -0.891), paddy (r = -0.911), chilli (r = -0.910), tomato (r = -0.921), capsicum (r = -0.893) and tobacco (r = -0.865).

Temperature at 10 cm soil depth for 30 days was found to have significantly strong and negative correlation for weed dry weight (30 DAS) in finger millet (r = -0.901), paddy (r = -0.920), chilli (r = -0.973), tomato (r = -0.921), capsicum (r = -0.913) and tobacco (r = -0.923).

4.9 Economics of different weed control treatments

Economics of different weed control treatments is presented in Tables 4.8a to 4.8f.

The maximum net income was obtained in the treatments with soil solarization 30 days TP in finger millet (Rs. 3138.00), paddy (Rs. 6375.00), chilli (Rs. 4406.00), tomato (Rs. 4098.00), capsicum (Rs. 9537.00) and tobacco (Rs. 7196.00). Similarly the benefit : cost ratio was

Table 4.8a Economics of weed control treatments in finger millet nursery.

Treatments	Gross income (Rs.)	Total cost (Rs.)	Net income (Rs.)	Benefit : cost ratio
T_1 : Soil solarization 15 days TP	4707.00	1868.00	2839.00	1.52:1.00
T_2 : Soil solarization 30 days TP	5006.00	1868.00	3138.00	1.61:1.00
T_3 : Soil solarization 15 days BP	4701.00	1967.00	2734.00	1.39:1.00
T_4 : Soil solarization 30 days BP	4819.00	1967.00	2852.00	1.45:1.00
T_5 : Mulching with coir pith at 5 t/ha	3402.00	1512.00	1890.00	1.25:1.00
T_6 : Mulching with Pongamia leaves at 5 t/ha	3350.00	1523.00	1827.00	1.20:1.00
T_7 : Mulchng with glyricidia leaves at 5 t/ha	3350.00	1523.00	1827.00	1.20:1.00
T_8 : Pendimethalin 1 kg ai/ha	0000.00	1538.00	-1538.00	-
T_9 : Unweeded control	2779.00	1463.00	1316.00	0.90:1.00
T_{10} : Hand weeding at 20 DAS	3072.00	1499.00	1573.00	1.05:1.00

Cost of polyethylene sheets

Transparent polyethylene : Rs. 3.50/m^2
Black polyethylene sheet : Rs. 4.50/m^2

Cost of pendimethalin 1 kg a.i/ha = Rs. 400/lit

Labour cost : Rs.36/day
Cost of coir pith : Rs.50/ton

Cost of Pongamia and Glyricidia leaves : Rs. 50/100 kg

Cost of seedlings : Rs. 3000/acre

Since polyethylene sheets are reusable, the total cost of polyethylene sheets is distributed equally for three seasons.

Table 4.8b Economics of weed control treatments in paddy nursery.

Treatments	Gross income (Rs.)	Total cost (Rs.)	Net income (Rs.)	Benefit : cost ratio
T_1 : Soil solarization 15 days TP	8804.00	2530.00	6274.00	2.48:1.00
T_2 : Soil solarization 30 days TP	8905.00	2530.00	6375.00	2.52:1.00
T_3 : Soil solarization 15 days BP	7515.00	2665.00	4850.00	1.82:1.00
T_4 : Soil solarization 30 days BP	8021.00	2665.00	5356.00	2.01:1.00
T_5 : Mulching with coir pith at 5 t/ha	5935.00	2174.000	3761.00	1.73:1.00
T_6 : Mulching with Pongamia leaves at 5 t/ha	5790.00	2185.00	3605.00	1.65:1.00
T_7 : Mulchng with glyricidia leaves at 5 t/ha	5746.00	2185.00	3561.00	1.63:1.00
T_8 : Pendimethalin 1 kg ai/ha	5104.00	2200.00	2904.00	1.32:1.00
T_9 : Unweeded control	4356.00	2125.00	2231.00	1.05:1.00
T_{10} : Hand weeding at 20 DAS	4927.00	2161.00	2766.00	1.28:1.00

Cost of polyethylene sheets

Transparent polyethylene : Rs. 3.50/m^2
Black polyethylene sheet : Rs. 4.50/m^2

Cost of pendimethalin 1 kg a.i/ha = Rs. 400/lit

Labour cost : Rs.36/day
Cost of coir pith : Rs.50/ton

Cost of Pongamia and Glyricidia leaves : Rs. 50/100 kg

Cost of seedlings : Rs. 6500/acre

Since polyethylene sheets are reusable, the total cost of polyethylene sheets is distributed equally for three seasons.

Table 4.8c Economics of weed control treatments in chilli nursery.

Treatments	Gross income (Rs.)	Total cost (Rs.)	Net income (Rs.)	Benefit : cost ratio
T_1 : Soil solarization 15 days TP	6622.00	2411.00	4211.00	1.74:1.00
T_2 : Soil solarization 30 days TP	6817.00	2411.00	4406.00	1.82:1.00
T_3 : Soil solarization 15 days BP	6442.00	2546.00	3896.00	1.52:1.00
T_4 : Soil solarization 30 days BP	6502.00	2546.00	3956.00	1.55:1.00
T_5 : Mulching with coir pith at 5 t/ha	4974.00	2055.00	2919.00	1.42:1.00
T_6 : Mulching with Pongamia leaves at 5 t/ha	4939.00	2066.00	2873.00	1.39:1.00
T_7 : Mulchng with glyricidia leaves at 5 t/ha	4918.00	2066.00	2852.00	1.38:1.00
T_8 : Pendimethalin 1 kg ai/ha	4683.00	2081.00	2602.00	1.25:1.00
T_9 : Unweeded control	4414.00	2006.00	2408.00	1.20:1.00
T_{10} : Hand weeding at 20 DAS	4759.00	2078.00	2681.00	1.29:1.00

Cost of polyethylene sheets

Transparent polyethylene : Rs. 3.50/m^2
Black polyethylene sheet : Rs. 4.50/m^2

Cost of pendimethalin 1 kg a.i/ha = Rs. 400/lit

Labour cost : Rs.36/day
Cost of coir pith : Rs.50/ton

Cost of Pongamia and Glyricidia leaves : Rs. 50/100 kg

Cost of seedlings : Rs. 4500/acre

Since polyethylene sheets are reusable, the total cost of polyethylene sheets is distributed equally for three seasons.

Table 4.8d Economics of weed control treatments in tomato nursery.

Treatments	Gross income (Rs.)	Total cost (Rs.)	Net income (Rs.)	Benefit : cost ratio
T_1 : Soil solarization 15 days TP	6021.00	2174.00	3842.00	1.76:1.00
T_2 : Soil solarization 30 days TP	6277.00	2179.00	4098.00	1.88:1.00
T_3 : Soil solarization 15 days BP	5831.00	2314.00	3517.00	1.52:1.00
T_4 : Soil solarization 30 days BP	6132.00	2314.00	3818.00	1.65:1.00
T_5 : Mulching with coir pith at 5 t/ha	4376.00	18236.00	2553.00	1.40:1.00
T_6 : Mulching with Pongamia leaves at 5 t/ha	4310.00	1834.00	2476.00	1.35:1.00
T_7 : Mulchng with glyricidia leaves at 5 t/ha	4328.00	1834.00	2494.00	1.36:1.00
T_8 : Pendimethalin 1 kg ai/ha	4235.00	1849.00	2386.00	1.29:1.00
T_9 : Unweeded control	3708.00	1774.00	1934.00	1.09:1.00
T_{10} : Hand weeding at 20 DAS	4108.00	1810.00	2298.00	1.27:1.00

Cost of polyethylene sheets

Transparent polyethylene : Rs. 3.50/m^2
Black polyethylene sheet : Rs. 4.50/m^2

Cost of pendimethalin 1 kg a.i/ha = Rs. 400/lit

Labour cost : Rs.36/day
Cost of coir pith : Rs.50/ton

Cost of Pongamia and Glyricidia leaves : Rs. 50/100 kg

Cost of seedlings : Rs. 4800/acre

Since polyethylene sheets are reusable, the total cost of polyethylene sheets is distributed equally for three seasons.

Table 4.8e Economics of weed control treatments in capsicum nursery.

Treatments	Gross income (Rs.)	Total cost (Rs.)	Net income (Rs.)	Benefit : cost ratio
T_1 : Soil solarization 15 days TP	14634.00	5629.00	9005.00	1.59:1.00
T_2 : Soil solarization 30 days TP	15166.00	5629.00	9537.00	1.69:1.00
T_3 : Soil solarization 15 days BP	14049.00	5764.00	8285.00	1.43:1.00
T_4 : Soil solarization 30 days BP	14316.00	5764.00	8552.00	1.48:1.00
T_5 : Mulching with coir pith at 5 t/ha	12233.00	5273.00	6960.00	1.32:1.00
T_6 : Mulching with Pongamia leaves at 5 t/ha	12102.00	5285.00	6817.00	1.29:1.00
T_7 : Mulchng with glyricidia leaves at 5 t/ha	12049.00	5285.00	6764.00	1.28:1.00
T_8 : Pendimethalin 1 kg ai/ha	11925.00	5300.00	6625.00	1.25:1.00
T_9 : Unweeded control	11495.00	5225.00	6270.00	1.20:1.00
T_{10} : Hand weeding at 20 DAS	11889.00	5261.00	6628.00	1.26:1.00

Cost of polyethylene sheets

Transparent polyethylene : Rs. 3.50/m^2
Black polyethylene sheet : Rs. 4.50/m^2

Cost of pendimethalin 1 kg a.i/ha = Rs. 400/lit

Labour cost : Rs.36/day
Cost of coir pith : Rs.50/ton

Cost of Pongamia and Glyricidia leaves : Rs. 50/100 kg

Cost of seedlings : Rs. 10,000/acre

Since polyethylene sheets are reusable, the total cost of polyethylene sheets is distributed equally for three seasons.

Table 4.8f Economics of weed control treatments in tobacco nursery.

Treatments	Gross income (Rs.)	Total cost (Rs.)	Net income (Rs.)	Benefit : cost ratio
T_1 : Soil solarization 15 days TP	9765.00	2850.00	6915.00	2.42:1.00
T_2 : Soil solarization 30 days TP	10046.00	2850.00	7196.00	2.72:1.00
T_3 : Soil solarization 15 days BP	9506.00	3095.00	6411.00	2.07:1.00
T_4 : Soil solarization 30 days BP	9596.00	3095.00	6501.00	2.10:1.00
T_5 : Mulching with coir pith at 5 t/ha	7186.00	2504.00	4682.00	1.87:1.00
T_6 : Mulching with Pongamia leaves at 5 t/ha	6991.00	2515.00	4476.00	1.78:1.00
T_7 : Mulchng with glyricidia leaves at 5 t/ha	6916.00	2515.00	4401.00	1.75:1.00
T_8 : Pendimethalin 1 kg ai/ha	0000.00	2530.00	-2530.00	-
T_9 : Unweeded control	6137.00	2455.00	3682.00	1.50:1.00
T_{10} : Hand weeding at 20 DAS	6675.00	2491.00	4184.00	1.68:1.00

Cost of polyethylene sheets

Transparent polyethylene : Rs. 3.50/m^2
Black polyethylene sheet : Rs. 4.50/m^2

Cost of pendimethalin 1 kg a.i/ha = Rs. 400/lit

Labour cost : Rs.36/day
Cost of coir pith : Rs.50/ton

Cost of Pongamia and Glyricidia leaves : Rs. 50/100 kg

Cost of seedlings : Rs. 7500/acre

Since polyethylene sheets are reusable, the total cost of polyethylene sheets is distributed equally for three seasons.

maximum in the treatment with soil solarization 30 days TP, finger millet (1.61 : 1.00), paddy (2.52 : 1.00), chilli (Rs. 1.82 : 1.00), tomato (Rs. 1.88 : 1.00), capsicum (1.69 : 1.00) and tobacco (2.72 : 1.00).

DISCUSSION

V. DISCUSSION

Soil mulches have been used to elevate soil temperature and moisture in the seed zone and enhance crop emergence and growth. The micro-climate under the mulch dependeds upon the timing of application and the type of mulch used.

The major objective of the investigation was to study the efficacy of soil solarization as an effective method of weed control in nursery beds, emphasis is given on the influence of the treatments on soil temperature enhancement and reduction in the number and dry weight of weeds. The results obtained are discussed in this chapter.

5.1 Effect of soil solarization on soil temperature

Transparent polyethylene mulches increases soil temperature in comparison to black polyethylene mulches (Horowitz et al., 1983) because polyethylene material is generally transparent to short wave radiation and is opaque to long wave radiation. This property increases the soil temperature by heating the soil and such material also prevents evaporation of water vapour from the soil (Mahrer, 1979) with an increase in the air temperature, soil temperature also increased.

Higher soil temperature was noticed in treatments which received soil solarization with transparent polyethylene sheets compared to the remaining treatments at 5 cm soil

depth. The increase in soil temperature at 5 cm soil depth was higher than the control by 8 to 9°C in treatments having transparent polyethylene sheets. Similar results were obtained by Stapleton et al. (1985).

At 10 cm soil depth, soil temperature was found to be less than that of 5 cm soil depth, this may be due to decrease in the rate of transmission of solar heat as the depth of the soil increases and most of the solar heat is used for heating of the upper layer of the soil. Similar results were observed at Naples, Italy, where the soil temperature attained through solarization was more at 5 cm depth than at 10 cm depth. Similar results were corroborated by Aloi and Noviello (1982) and Chauhan et al. (1988).

Mulching with coir pith at 5 t/ha, pongamia leaves at 5 t/ha and glyricidia leaves at 5 t/ha did not give significant increase in the soil temperature over control. This may be attributed to the less quantity of coir pith and attack of termite in case of coir pith and dried leaves of pongamia and glyricidia did not remain on the bed.

5.1.1 Effect of soil temperature on type of polyethylene

Treatments receiving soil solarization with transparent polyethylene sheets and black polyethylene sheets recorded significant increase in soil temperature over control. But maximum soil temperature was noticed in transparent

polyethylene. The maximum soil temperature increased by 10-14°C and 2-5°C in transparent and black polyethylene sheets respectively. Similar findings were also reported by Emani (1991), Habeebur Rahman (1992) and Harti (1991). This may be attributed to the less transmission of absorbed solar heat to the soil in black polyethylene.

5.2 Effect of soil solarization on weed control

5.2.1 Effect of soil solarization on number of weeds and dry weight of weeds in nursery

The treatments where soil solarization was done with transparent polyethylene sheets had given significant reduction in the number and dry weight of dicot weeds compared to the control. Thus, soil solarization with transparent polyethylene sheets had given effective control of dicot weeds. This may be attributed to killing of dicot weed seeds located in the upper soil layer by increasing the soil temperature. Similar results were also reported by Rubin and Benjamin (1983) and Cartia (1985).

The number of dicot weeds were least in soil solarization 30 days TP, in finger millet (1.29 to 2.11/0.25 m^2), paddy (1.55 to 2.11/0.25 m^2) chilli (1.17 to 2.18/0.25 m^2), tomato (1.38 to 2.09/0.25 m^2), capsicum (1.28 to 2.12/0.25 m^2) and tobacco (0.33 to 2.61/0.25 m^2). Similarly the dry weight of dicot weeds (g/0.25 m^2) was least in the

treatment which received soil solarization 30 days TP. This may be due to rise in temperature to higher levels by TP which might have caused the death or damage to the weed seeds present in the soil to a greater extent, thus reducing the emergence to the minimum. Similar results were reported by Standifer et al. (1984) and Patel et al. (1990) also observed the superiority of TP over BP with superiority of TP over BP with respect to reduction in weed count.

Treatment receiving transparent polyethylene sheets for 30 days had given significant reduction in the number of monocot weeds in finger millet (1.67 to 2.33/0.25 m^2), paddy (1.76 to 2.33/0.25 m^2), chilli (1.55 to 2.30/0.25 m^2), tomat (1.76 to 2.52/0.25 m^2), capsicum (1.38 to 2.11/0.25 m^2) and in tobacco (1.34 to 2.61/0.25 m^2).

In general, longer duration of solarization for 30 days with TP effected maximum reduction in weed count. This may be due to the availability of more number of days with soil temperature exceeding lethal levels of 40-50°C. These observations are in line with Braun et al. (1987) and Fahim et al. (1987). Similarly, the dry weight of monocot weeds (g/0.25 m^2) was least in the treatment which received soil solarization 30 days TP. This effect could be ascribed due to the effect of high temperature achieved by soil solarization. Similar reduction in dry weight of weeds due

to soil solarization has also been reported by Katan et al. (1983) and Stapleton et al. (1989). Transparent polyethylene sheets recorded significantly lower monocot number and dry weight of monocots than black polyethylene sheets. This may be due to ineffective transmission of solar heat through black polyethylene as observed by Chauhan et al. (1988).

The number and dry weight of sedges were least in soil solarization with TP for 30 days than soil solarization with BP for 30 days. This may be attributed to partial weed control by soil solarization with black polyethylene. Similar findings were also reported by Chauhan et al. (1988).

The total number and dry weight of weeds were least in soil solarization for 30 days with TP. The total dry weight of weeds in soil solarization with TP for 30 days in finger millet (1.3 to 3.42 g/0.25 m^2), paddy (1.38 to 3.40 g/0.25 m^2), chilli (1.24 to 3.36 g/0.25 m^2), tomato (1.36 to 3.86 g/0.25 m^2), capsicum (1.29 to 3.42 g/0.25 m^2) and tobacco (1.18 to 3.94 g/0.25 m^2) at weekly intervals of nursery. This was mainly due to raising of soil temperature to lethal levels where there is direct killing of weed seeds by heat, killing of seed stimulated to germinate in the moistened mulched soil and killing of germinating seeds whose dormancy is broken.

5.2.2 Effect of duration of soil solarization on weed control

Soil solarization for 30 days had given significantly lesser total weed number and dry weight in both transparent and black polyethylene sheet treatments than the control. This was attributed to the availability of more number of days with soil temperature exceeding lethal levels of 40 and 50°C. These observations are in line with the findings of Hildebrand (1986) and Silveira et al. (1990).

5.2.3 Effect of type of polyethylene sheet on weed control

Soil solarization with transparent polyethylene had given significantly lesser total weed number and total dry weight than soil solarization with black polyethylene. This may be due to higher increase in soil temperature in transparent polyethlene than black polyethylene, due to less transmission of absorbed solar heat to the soil in black polyethylene. The observations were in line with the findings of Rubin and Benjamin (1983) and Patel et al. (1990).

5.2.4 Effect of other weed control treatments in comparison with soil solarization treatments on weed control

Hand weeding at 20 DAS had given significantly higher total number of weeds and total dry weight of weeds than that of soil solarization for 30 days with TP till 28 days after

sowing. Pendimethalin at 1 kg a.i./ha recorded higher total dry weight of weeds in finger millet (1.18 to 3.73 g/0.25 m^2), paddy (2.01 to 3.70 g/0.25 m^2), chilli (1.82 to 3.86 g/0.25 m^2), tomato (1.81 to 3.70 g/0.25 m^2), capsicum (1.26 to 3.51 g/0.25 m^2) and tobacco (1.70 to 4.51 g/0.25 m^2) than that of soil solarization for 15 days and 30 days TP. Mulching with coir pith, pongamia and glyricidia leaves at 5 t/ha were not decreased the total weed number and dry weight.

5.3 Effect of weed control treatments on germination percentage of nursery crops

The treatment where soil solarization was done with transparent polyethylene for 30 days recorded highest germination percentage, in finger millet (92.3%), paddy (93.1%), chilli (90.9%), tomato (90.3%), capsicum (91.1%) and tobacco (89.3%). This may be attributed to the increased temperature in transparent polyethylene as noticed by Horowitz et al. (1983).

In finger millet and tobacco, pendimethalin treated plot recorded no germination percentage. This may be due to phytotoxicity of the chemical on seedlings.

5.4 Effect of weed control treatments on growth components

The increased root length in soil solarization with TP for 30 days, in finger millet (1.69 to 3.46 cm), paddy (2.37 to 7.03 cm), chilli (2.40 to 7.00 cm), tomato (3.06 to

9.26 cm), capsicum (2.90 to 8.60 cm), tobacco (1.47 to 2.20 cm) may be due to better availability of growth resources in the plots with longer duration of solarization. The resource availability in tu might have been increased on account of reduction in weed growth by higher temperature achievedin soil solarization with TP for 30 days. Pendimethalin at 1 kg a.i./ha, mulching with coir pith, pongamia leaves and glyricidia leaves, recorded less root length in finger millet, paddy, chilli, tomato, capsicum and tobacco nursery. This was attributed to excessive infestation of weeds. Hand weeded treatment recorded more root length after 20 days. This may be due to better weed control after 20 DAS and thereby improvement in the morphological and growth parameters in this treatment. In pendimethalin treated plot there were no finger millet and tobacco seedlings. This may be due to slight phytotoxicity of the chemical on seedlings.

Root vigour in soil solarization with transparent polyethylene for 30 days is more than soil solarization with transparent polyethylene for 15 days. This was mainly attributed to higher temperature for longer duration which has induced better weed suppression. Mulching with coir pith, pongamia and glyricidia leaves recorded less root vigour. This may be due to less temperature of the soil resulted in more crop weed competition by these mulches.

Pendimethalin at 1 kg a.i./ha recorded less root vigour. This was attributed to short root length due to mild phytotoxicity on seedlings. Hand weeding at 20 DAS recorded more root vigour on third and fourth week after germination, in finger millet (2.48 to 2.74) paddy (3.61 to 4.89), chilli (3.86 to 4.66), tomato (5.77 to 6.03), capsicum (4.42 to 5.25) and tobacco (1.64 to 1.80). This was probably owing to better weed control and less competition offered by weeds for the available resources.

Solarization with plastic mulches recorded more shoot length compared to mulching with coir pith, pongamia leaves and glyricidia leaves. This may due to minimum competition offered by weeds for the available resources in solarized plots. Mulching with coir pith recorded more shoot length than control. This may be attributed to 1-3°C rise in temperature during solarization period compared to control.

The increase in shoot length in soil solarization with transparent polyethylene for 30 days in finger millet (2.20 to 3.64 cm), paddy (3.73 to 11.5 cm), chilli (3.41 to 11.03 cm), tomato (6.25 to 15.0 cm), capsicum (4.10 to 12.03 cm) and tobacco (1.72 to 2.42 cm) was more as compared to all other treatments. This can be attributed to the drastic reduction in weed count and dry weight of weeds.

The increased shoot vigour in soil solarization treatments was mainly due to several modes of action

including thermal inactivation of weed seeds and weakening of propagules which alters the plant root environment and results in better response in terms of increased growth (Stapleton and Devay, 1986). Treatments with soil solarization using black polyethylene gave significantly less shoot vigour than that of soil solarization with transparent polyethylene. This was attributed to lesser weed control in solarization with black polyethylene. Mulching with coir pith, pongamia and glyricidia leaves did not contribute much towards shoot vigour. This can be due to the competition between weeds and the crop for the growth resources.

More plant height was recorded in soil solarization with transparent polyethylene for 30 days in finger millet (3.20 to 5.40 cm), paddy (6.40 to 15.1 cm), chilli (4.5 to 12.9 cm), tomato (8.3 to 19.6 cm), capsicum (4.9 to 1.3 cm) and tobacco (2.3 to 2.9 cm). This may be attributed to the drastic reduction in weed count and dry weight on account of solarization and less competition for the growth responses. Hand weeded treatment recorded more height after 20 days compared to control. This was mainly due to less crop weed competition. Mulching with coir pith, pongamia and glyricidia leaves did not record more height because of more infestation of weeds.

Dry weight per plant in black polyethylene is less compared to transparent polyethylene. This was attributed to

raised temperature of soil in transparent polyethylene. Higher temperature induced more weed suppression in transparent polyethylene. Pendimethalin at 1 kg a.i./ha, mulching with coir pith, pongamia and glyricidia leaves recorded less dry weight of seedlings due to poor growth of seedlings with increased weed competition. More dry weight was recorded in soil solarization with transparent polyethylene for 30 days in finger millet (1.58 to 2.84 g/plant), paddy (1.66 to 6.43 g/plant), chilli (1.26 to 6.00 g/plant), tomato (1.70 to 8.36 g/plant), capsicum (1.16 to 5.83 g/plant) and tobacco (1.35 to 2.51 g/plant). This was attributed to the better weed control thereby better growth of plants.

In general, soil solarization with transparent polyethylene for 30 days recorded significantly more root length, shoot length, root vigour, shoot vigour, plant height and dry weight per plant was due to better weed control by soil solarization with reduced competition for growth resources. However, this in line with findings of Vijaya Bhaskar (1995). Growth components in pendimethalin at 1 kg a.i./ha was recorded less due to slight toxicity of the chemical on seedlings. Mulching with coir pith, pongamia and glyricidia leaves recorded less growth components. This may be due to higher competition from weeds.

5.5 Economics of different weed control treatments

Soil solarization with TP for 30 days recorded higher gross income in finger millet (Rs. 5006.00), paddy (Rs. 8905.00), chilli (Rs. 6817.00), tomato (Rs. 6277.00), capsicum (Rs. 15166.00) and tobacco (Rs. 10046.00) than the remaining treatments. This could be due to higher germination percentage of crop seeds. Treatments receiving polyethylene recorded higher total cost as compared to the remaining treatments. This is attributed to the high cost incurred on the polyethylene sheets.

5.6 Practical application of the results

Soil solarization is a non-chemical method which is not hazardous to the user and does not involve substances toxic to the consumer, to thehost plant, or the other organisms. This method has the characteristics of an integrated control since physical, chemical and biological mechanisms are involved because of which control of weeds is achieved.

It can only be used in regions where the climate is suitable and the soil is free of crops for about one month or more at the time of mulching. It is expensive but feasible in nursery and high value crops. The period of use is limited to 4 to 6 weeks, thus reduces the cost by using the material again.

From this study it can be concluded that solarization for 30 days with transparent polyethylene was highly effective in controlling weeds thereby increasing the growth of nursery crops. Higher benefit : cost ratio was recorded in solarization with transparent polyethylene for 30 days.

Future line of work

1. Solarization for longer periods have to be tried for effective weed control.
2. Study on microbial activity during solarization period.
3. Study on mineralization of nutrients as influenced by soil solarization.
4. It would be desirable to study the effect of soil solarization on soil moisture.

SUMMARY

VI. SUMMARY

A field experiment was conducted at Main Research Station, University of Agricultural Sciences, Hebbal, Bangalore during April to August, 1996. The investigation involved soil solarization with transparent polyethylene and black polyethylene for 15 and 30 days, mulching with coir pith, pongamia and glyricidia leaves at 5 t/ha, pendimethalin at 1 kg a.i./ha and hand weeding at 20 DAS. The results obtained have been summarised in this chapter.

The major weed flora of the experimental site includes Cynadon dactylon Pers., Digetaria marginata Link., Echinochloa colonum (L.) among monocots and Acanthospermum hispidium D.C., Euphorbia hirta L., Eclipta alba Hassk., among dicots and the only sedge that was observed was Cyperus rotundus L.

The results indicated that the polyethylene mulch treatments significantly increased soil temperature as compared to other treatments, but the black polyethylene was less effective than the transparent mulch.

Highest increase in soil temperature by 8-12°C over control was observed in treatments which received soil solarization with transparent polyethylene sheets at 5 cm soil depth. The rise in soil temperature was decreased at 10 cm soil depth in both transparent polyethylene and black

polyethylene sheets. Among the different durations of solarization in transparent and black polyethylene for 30 days of solarization was found effective in reducing the number of weeds and dry weight of weeds. Mulching with coir pith, pongamia and glyricidia leaves did not give significant increase in the soil temperature over control.

Root length was found to be more in soil solarization with TP for 30 days in finger millet (1.69 to 3.46 cm), paddy (2.37 to 7.03 cm), chilli (2.40 to 7.00 cm), tomato (3.06 to 9.26 cm), capsicum (2.90 to 8.60 cm) and tobacco (1.47 to 2.20 cm), pendimethalin at 1 kg a.i./ha, mulching with coir pith, pongamia and glyricidia leaves recorded less root length. Soil solarization with black polyethylene also recorded less root length than transparent polyethylene.

The data on root vigour indicated that all the solarization treatments had significantly more root vigour compared to other treatments. The lowest root vigour was observed in unweeded control. Among the solarization treatments, soil solarization with transparent polyethylene for 30 days recorded more root vigour in finger millet (1.64 to 3.32), paddy (2.2 to 6.53), chilli (2.16 to 6.29), tomato (2.75 to 8.34), capsicum (2.63 to 5.45) and tobacco (1.40 to 2.09). Mulching with coir pith, pongamia and glyricidia leaves did not differ significantly with the control.

Significant differences were obtained with soil solarization treatments compared to control in shoot length. Pendimethalin at 1 kg a.i./ha did not differ significantly with the control. Treatments with black polyethylene recorded less shoot length compared to transparent polyethylene. Mulching with coir pith, pongamia and glyricidia leaves did not differ significantly with the control. Soil solarization with transparent polyethylene for 30 days recorded more shoot length compared to soil solarization with transparent polyethylene for 15 days. Least shoot length was recorded in control in finger millet (1.71 to 2.61 cm), paddy (1.96 to 5.93 cm), chilli (1.63 to 7.50 cm), tomato (3.19 to 11.33 cm), capsicum (1.90 to 8.00 cm) and tobacco (1.34 to 1.93 cm).

Shoot vigour was found to be more in soil solarization treatments compared to other treatments. Soil solarization with transparent polyethylene for 30 days recorded more shoot vigour in finger millet (2.12 to 3.50), paddy (3.46 to 10.69), chilli (3.06 to 9.92), tomato (5.62 to 13.50), capsicum (3.72 to 10.94) and tobacco (1.63 to 2.30). Pendimethalin at 1 kg a.i./ha, mulching with coir pith, pongamia and glyricidia leaves did not differ significantly with the control.

The results indicated that the polyethylene mulches recorded more plant height compared to other treatments, but

the transparent polyethylene was found to be more effective than black polyethylene. Soil solarization with transparent polyethylene for 30 days recorded more plant height in finger millet (3.25 to 5.42 cm), paddy (6.43 to 15.16 cm), chilli (4.50 to 12.96 cm), tomato (8.33 to 19.16 cm), capsicum (4.96 to 13.0 cm) and tobacco (2.30 to 2.96 cm). Mulching with coir pith, pongamia and glyricidia leaves and pendimethalin at 1 kg a.i./ha recorded more plant height than control.

Dry matter production in unweeded control was found to be least compared to other treatments. Black polyethylene mulches were found to be less effective than transparent polyethylene mulches. Soil solarization with transparent polyethylene for 30 days recorded more dry matter production in finger millet (1.58 to 2.84 g/plant), paddy (1.16 to 6.43 g/plant), chilli (1.26 to 6.00 g/plant), tomato (1.70 to 8.36 g/plant), capsicum (1.16 to 5.83 g/plant) and tobacco (1.35 to 2.51 g/plant). Mulching with coir pith, pongamia leaves and glyricidia leaves and pendimethalin at 1 kg a.i./ha recorded more dry matter production than control.

The number and dry weight of dicot weeds was least in the treatment which received soil solarization with TP for 30 days till 28 days after sowing. The number and dry weight of monocot weeds was least in soil solarization 30 days TP. Transparent polyethylene sheets recorded significant

reduction in the number and dry weight of dicots, monocots and sedges than that of black polyethylene sheets. Mulching with coir pith, pongamia and glyricidia leaves at 5 t/ha did not give significant difference over control for number and dry weight of dicots, monocots and sedges.

The total number of weeds and dry weight of weeds were least in soil solarization for 30 days with transparent polyethylene and black polyethylene sheet treatments than control.

Hand weeding at 20 DAS recorded lesser total number of weeds and total dry weight of weeds than in pendimethalin at 1 kg a.i./ha. Mulching with coir pith, pongamia and glyricidia leaves at 5 t/ha had not decreased the total weed number and total dry weight of weeds.

Gross income obtained from the treatments in soil solarization with TP for 30 days was higher in finger millet (Rs. 5006.00), paddy (Rs. 8905.00), chilli (Rs. 6817.00), tomato (Rs. 6277.00), capsicum (Rs. 15166.00) and tobacco (Rs. 10046.00) than the remaining treatments. Benefit : cost ratio was highest in solarization with TP for 30 days in finger millet (1.61 : 1.00), paddy (2.52 : 1.00) chilli (1.82 : 1.00), tomato (1.88 : 1.00), capsicum (1.69 : 1.00) and tobacco (2.72 : 1.00).

From the above results, it can be concluded that soil solarization with transparent polyethylene for 30 days is the best method of controlling weeds and increasing benefit : cost ratio.

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* = Original not seen.

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