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Weed management practices in finger millet: A review

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Abstract

Finger millet production requires a lot of labour, particularly for weed management practices. Weed spectrum depends on the efficiency of the finger millet ecosystem and control measures practiced. A most possible way for controlling weeds is by manipulating the cropping system and making conditions more favourable for crop growth and unfavourable for weed growth. Weeds belong to various groups viz., grasses, sedges and broad leaved weeds (BLW) are associated in finger millet cultivation. The weed management practices are limited to five options viz., preventive, cultural, mechanical, chemical and biological methods. The common weed control method used is the hand weeding which is time consuming and also difficult to control weeds. Although manual weeding is effective, it is costly, tedious and time consuming. Fischer *et al.* (2001) reported that the increasing cost of labour have made these methods uneconomical for weed control. Since single method is not able to control all weeds up to desired level, integration of weed management practices can be an effective weed control strategy to achieve greater weed control efficiency and increase overall benefit of finger millet cultivation.

Keywords: Finger millet, weed management, weed control, growth and yield

Introduction

Finger millet (*Eleusine coracana* (L.) Gaertn.) is one of the staple cereal food crop for majority of people in the arid and semi-arid tropics of South Asia and Africa. It is an important cereal crop for those who depend on subsistence farming in dry areas like Eastern Africa, India and Srilanka. It can be grown in poor water supplying capacity and nutrient deficient soils due to its resilience and ability to withstand aberrant weather conditions. In India, the area under finger millet cultivation is 1.19 million hectares with the production of 1.99 million tonnes and the average productivity of 1.66 tonnes/ha ("Indiastat.com," 2017-2018). In tropical countries like India the production and productivity is lowering due to the abundance of sunlight and temperature which are prevailing almost throughout the year thus providing congenial environment for growth of different weed species. Weeds infestation is considered one of the major constraints which cause yield reduction in finger millet accounting for about 34 to 61 per cent in finger millet (Ramachandra Prasad *et al.*, 1991) [35]. Effective weed management practices are more important, otherwise the weeds that grow with the crop deplete considerable amount of plant nutrients, which results in lower crop yields. The mechanical and cultural methods of weed control are no doubt effective but the non availability and ever increasing cost of labour have made the farmers to face the labour shortage. Rathore *et al.* (2010) [38] revealed that the labour requirement was substantially reduced (21%) with application of post emergence herbicide for weed control compared to intercultural operation.

The use of herbicides has been proved successful in controlling weeds compared to that of labour scarcity and prohibitive wages. Under these situations herbicides play an important role in weed management. Herbicides have better weed control at initial stage thereby providing the crop an advantage of competitive edge over the later emerging weeds. Kumara *et al.* (2007) [18] reported that the herbicides are economical and cost effective in managing weeds during initial stages as compared to hand weeding. This indicated that the advantages of using herbicides are many folds which are effective in controlling the wide range of weed flora. This increased yield provided in higher monetary returns, similarly when compared to unweeded control, considering the gross returns and cost of weed management practices, the benefit accrued due to weed management was considerably higher.

Effect of transplanted finger millet on weed management

Finger millet is still dominated as marginal crop and grown under poor management. Planting method varies among farmer according to their choice, leisure period and where they are cultivated. The most practiced method is broadcasting and transplanting. A more possible way to control weeds is by manipulating cropping system and making condition more favorable for crop and unfavorable for weed growth. Crop competitive ability can be increased by choosing a cropping method which gives more population and is able to suppress the weeds. In broad casting, there is an uneven distribution of plants which causes the competition among finger millet for moisture and nutrient. In transplanting, the finger millet crop will become a competitive edge over weed.

Weed flora in finger millet field

Nanjappa and Hosmani (1985) [22] found that finger millet crop was heavily infested with monocot weeds than dicot weeds. This may be due to the reason that grass weeds and finger millet crop belong to the same taxonomic family and they have similar morphological characters. Singh and Saha (2001) [44] reported that weed flora of the experimental field were *Echinochloa crusgalli* among grasses, *Fimbristylis miliacea* among sedges, *Commelina benghalensis* and *Ageratum conyzoides* among broad leaved weeds on sandy clay loam soils of Ranchi, Jharkhand. Ramamoorthy *et al.* (2002) [36] stated that annual broad leaved weeds like *Trianthema portulacastrum* and *Boerhaavia diffusa* and grassy weed *Dactyloctenium aegyptium* were the major weeds in the experimental field of Coimbatore, Tamil Nadu. Kumara *et al.* (2007) [18] revealed that the major weed flora in finger millet were *Cyperus rotundus*, *Digitaria marginata*, *Dactyloctenium aegyptium*, *Cynodon dactylon*, *Chloris barbata* from initial stages and *Echinochloa colona* from 60 days after planting. Whereas, among broad leaf weeds, major weeds were *Commelina benghalensis*, *Lagasea mollis*, *Ageratum conyzoides*, *Spilanthes acmella*, *Acanthospermum hispidum* from initial stages and *Borreria articularis* and *Euphorbia hirta* from 60 days after planting.

Pradhan and Singh (2009) [29] reported that predominant weeds found in weedy check plot were *Echinochloa colona*, *Digitaria sanguinalis*, *Cyperus rotundus* and *Eleusine indica* as narrow leaf weeds, *Celosia argentea*, *Commelina benghalensis*, *Euphorbia geniculata* as broad leaf weeds. Pradhan *et al.* (2010) [30, 31] noticed that *Digitaria sanguinalis*, *Eleusine indica*, *Setaria glauca*, *Cyperus rotundus* and *Echinochloa colona* among monocot and *Celosia argentea*, *Commelina benghalensis*, *Spilanthes ecmela* and *Euphorbia geniculata* among dicot weeds were dominant in finger millet. Gowda *et al.* (2012) [13] reported that the density of *Cyperus rotundus*, *Digitaria marginata*, *Cynodon dactylon*, *Commelina benghalensis*, *Ageratum conyzoides* and *Spilanthes acmella* was higher in proportion at 30, 60 DAS and at harvest. Patil (2013) [25, 27] observed that major weed flora in transplanted finger millet were *Cyperus rotundus* among sedges, *Echinochloa colona*, *Digitaria marginata*, *Cynodon dactylon*, *Dactyloctenium aegyptium*, *Eragrostis pilosa* (at initial stages), *Eleusine indica* (at later stages) among grasses. Among broad leaved weeds *Parthenium hysterophorus*, *Alternanthera sessilis*, *Sida acuta*, *Spilanthes acmella*, *Commelina benghalensis*, *Ageratum conyzoides*, *Ocimum canum* were present. Prithvi *et al.* (2015) [34] the dominant weed flora of the experimental field was *Cynodon dactylon* and *Digitaria marginata* among grasses, *Cyperus*

bulbosus among sedges, *Sesamum ekamberi*, *Trianthema portulacastrum* and *Portulaca oleracea* among broad leaved weeds.

Banu *et al.* (2016) [4] reported that predominant weed flora observed in the experimental field of GKVK, Bengaluru during investigation includes *Dactyloctenium aegyptium*, *Cynodon dactylon*, *Digitaria marginata*, *Panicum miliacea*, *Eleusine indica* and *Echinochloa colona* among grasses, *Portulaca oleracea*, *Parthenium hysterophorus*, *Ageratum conyzoides*, *Commelina benghalensis*, *Mollugo disticha*, *Phyllanthus niruri*, *Alternanthera spp.*, *Sida acuta*, *Sida cardifolia*, *Amaranthus viridis*, *Miomosa pudica*, *Bidens pilosa*, *Achyranthes aspera* among broad leaved weeds and *Cyperus rotundus* and *Cyperus esculentus* were major sedges in transplanted finger millet system. Chavan *et al.* (2017) [8] found that in Kharif finger millet major weeds observed were *Cynodon dactylon*, *Cyperus rotundus*, *Eragrostis coarctata* and *Eragrostis minor* among grasses and *Amaranthus viridis*, *Ageratum conyzoides*, *Commelina benghalensis*, *Celosia argentea*, *Convolvulus arvensis*, *Euphorbia hirta*, *Portulaca oleracea* and *Tridax procumbens* among broad leaved weeds. The predominant weed flora observed in the experimental field in association with the direct sown finger millet were among grasses viz., *Echinochloa crusgalli*, *Dactyloctenium aegyptium* and *Eleusine indica*, broad leaved weeds *Commelina benghalensis*, *Ageratum conyzoides*, *Commelina nodifolia* and *Oldenlandia corymbosa* and among sedges *Cyperus rotundus* (Satish *et al.*, 2018) [41].

The major grass weeds were *Brachiaria mutica* (L.), *Cynodon dactylon* (L.), *Dactyloctenium aegyptium* (L.), *Echinochloa colona* (L.) and common sedges includes *Cyperus iria* (L.) and *Cyperus rotundus* (L.) and broad leaved weeds includes *Eclipta alba* (L.) and *Trianthema portulacastrum* (L.) were the dominant species in transplanted finger millet ecosystem of Trichirappalli, Tamil Nadu (Shanmugapriya *et al.*, 2019) [42, 43]. Kujur *et al.* (2019) [16] observed that the major weed flora in finger millet were *panicum maxima*, *Eleusine indica*, *Cyperus spp.*, *Cynodon dactylon*, *Celosia argentea*, *Alternanthera sessilis*, *Alternanthera triandra* and *Ageratum conyzoides*.

Critical period for weed competition

‘Critical period’ defines the maximum period weeds can be tolerated without affecting final crop yields (Zimdahl, 1980) [48]. Lall and Yadav (1982) [20] reported that critical period for weed competition in finger millet is from 25 to 45 DAS was most crucial to provide weed free conditions to the crop. Nanjappa and Hosmani (1985) [22] have recommended keeping the plots free from weeds up to four weeks after transplanting to obtain higher grain yield of finger millet. Nanjappa *et al.* (1987) [23] reported that during the first 2 to 6 weeks period after transplanting, the weeds removed a major amount of soil nutrients (critical period of crop weed competition). Delay in the weed control significantly reduced the yield upto 70 per cent (Mastana Reddy, 1986; Ramachandra Prasad *et al.*, 1991) [21, 35]. Weed control during early stages of crop growth period assumes important as revealed from the significant decrease in yield due to delay in weeding from 15-65 days after seedling (Ghosh, 2000) [11].

Initial growth period of finger millet is subjected to infestation of weeds causing higher competition, leading to drastic reduction in yield (Kushwaha *et al.*, 2002) [19]. Anon. (2004) [1] observed in finger millet, keeping plots weed free throughout crop growth period recorded significantly higher grain yield (2972 kg/ha) and being on par with weed free for

first 35 day from sowing (2662 kg/ha) as compared to unweeded check (1527 kg/ha). Pradhan and Patil (2010)^[30, 31] reported that critical period of weed control in finger millet was between 20 to 30 DAS. Crop weed competition was severe during early stages of crop growth than later stages. The critical period of weed competition lies at early growth stages between 20 and 30 days after emergence of the crop (Asargew and Fekremariam, 2014)^[3]. Satish *et al.* (2018)^[41] reported that the critical period of weed competition was 5 weeks after sowing in case of direct seeded finger millet.

Methods of weed control

Chemical weed management

The potential use of herbicides would be the timely weed control or delay in weed growth or check the weed growth during the crop growth period (Ogborn, 1969)^[24]. The advantage of using herbicides are many fold which include effective control of wide spectrum of weeds and which are economical in operation (De Datta and Lagas, 1984)^[9]. There is also a demand from farmers for the selective pre or post emergence herbicides which became cheaper when compared to manual weeding for timely control of weeds in finger millet crop.

Gowda *et al.* (1997)^[12] and Jena and Tripathi (1997)^[19] indicated that herbicide were as efficient methods of weed control in direct sown finger millet. In drill sown finger millet, lower weed density, dry weight and higher weed control efficiency were recorded under PE bensulfuron methyl + pretilachlor at 10 kg/ha (Kumar *et al.*, 2015)^[17]. Banu *et al.* (2016)^[4] found that in finger millet, PE bensulfuron methyl + pretilachlor at 660 g/ha recorded higher weed control efficiency. Kujur *et al.* (2019)^[16] reported that higher herbicide use efficiency was owing to superior weed control both in terms of reduction in density and biomass of weeds. Varnekar *et al.* (2019)^[47] indicated that timely weed control will reduce the weed competition and it ultimately results in increased yield. Chemical weed control will confirm the timely weed control and also avoid the labour dependence.

Hand weeding

Channa Naik *et al.* (2001)^[7] stated that hand weeding thrice at 20, 40 and 60 DAS resulted in 73 (32.3 q/ha) and 84 (36.0 q/ha) per cent higher yield over weedy check in 1995 and 1996, respectively and it was statistically on par with weed free check. It was mainly due to non competition of weeds during critical period of crop growth. Kumara *et al.* (2007)^[18] reported that in finger millet hand weeding at 20 and 40 DAS recorded lower weed population (8.4/m²), lower weed dry weight (9.8/m²) and higher weed control efficiency (94.8%). Ramamoorthy *et al.* (2010)^[37] concluded that lower weed population and weed dry weight were recorded with one inter cultivation on 15 DAS and two hand weeding on 30 and 45 DAS.

Patil (2013)^[25, 27] reported that in finger millet hand weeding at 20 and 30 DAT recorded significantly lower weed population (22.60/m²), weed dry weight (9.4 g/m²), higher weed control efficiency (91.0 %), grain yield (5.6 t/ha) and straw yield (7.2 t/ha). Patil *et al.* (2014)^[26] reported that hand weeding twice at 20 and 30 DAP is the best efficient method for the control which produces significantly higher yield and weed control efficiency in finger millet. Satish *et al.* (2018)^[41] found that one hand weeding at 20 DAS *fb* two inter-culture at 30 and 45 DAS had significantly reduced dry weight of grassy, broad leaved and sedges (0.36 g/m², 2.05 g/m² and 0.00 g/m², respectively) at 60 DAS in direct seeded

finger millet. Kujur *et al.* (2019)^[16] found that uncontrolled weeds reduced the grain and straw yield of ragi by 72 per cent, when compare with two hoeing done at 20 and 40 DAS, which was due to high weed density and biomass in weedy check throughout the crop growth period.

Integrated weed management (IWM)

Effect of IWM on weed control

The integration of chemical and cultural control further increased the weed control and enabled that herbicide rates to be reduced (Reddy *et al.*, 1990)^[39]. Anon. (2004)^[1] reported that oxyfluorfen at 0.1 kg/ha as pre-emergence application combined with two inter cultivations recorded significantly lower weed density and dry weight over unweeded check. In finger millet, pre-emergence applications of oxyfluorfen at 0.05 lit/ha along with two inter cultivations and one hand weeding recorded lower weed density and higher weed control efficiency as compared to unweeded check (Anon., 2007)^[2]. In rainfed finger millet, lower weed density and dry weight were registered in inter cultivation at 15 DAS and hand weeding at 30 and 45 DAS (Ramamoorthy *et al.*, 2010)^[37]. Pradhan *et al.* (2010)^[30, 31] reported that in finger millet application of oxyfluorfen at 0.25 kg/ha + one hand weeding at 20 DAS resulted in higher weed control efficiency (60.18%), lower weed density (1.0/m²) and weed dry weight (2.01 g/m²). Sangeeta Kujur (2016)^[40] reported that the relative dry weight of dominant monocot, dicot and total dry weight were noticed minimum under hoeing twice by wheel hoe between rows and intra row manual weeding and hand weeding twice. Satish *et al.* (2018)^[41] reported that lower weed dry weight and higher WCE were resulted under hand weeding at 20 DAS *fb* inter cultivation at 30 and 45 DAS and it was comparable with PE bensulfuron methyl + pretilachlor at 3 kg/ha *fb* inter cultivation on 45 DAS in direct seeded finger millet. Kujur *et al.* (2019)^[16] reported that lower weed density, weed dry weight and higher weed control efficiency was recorded in hoeing twice by wheel hoe between rows and intra-row manual weeding and hand weeding twice at 20 and 40 DAS. In transplanted finger millet, the lowest total weed density, total weed dry weight and higher WCE were registered in PE application of bensulfuron methyl 0.6 G at 60 g/ha + pretilachlor 6 G at 600 g/ha *fb* EPOE application of bispyribac sodium 10 SC at 25 g/ha and it was followed by hand weeding on 15 and 30 DAT (Shanmugapriya *et al.*, 2019)^[42, 43].

Effect of IWM on growth attributes

In finger millet, pre emergence application of oxyfluorfen at 0.25 kg/ha + two hand weeding at 20 and 45 DAS recorded higher plant height (97.6 cm) and number of tillers (4.6/ plant) as reported by Pradhan *et al.* (2010)^[30, 31]. Patil *et al.* (2013)^[25, 27] reported that in finger millet hand weeding at 20 and 30 days after transplanting recorded higher dry weight (36.4 g/plant) and leaf area (990.50 cm²/hill).

Banu (2014)^[5] found that PE bensulfuron methyl + pretilachlor at 660 g/ha registered the tallest plants in transplanted finger millet. Prashanth Kumar (2014)^[33] reported that PE bensulfuron methyl + pretilachlor at 7.5 kg/ha recorded higher plant height in drill sown finger millet. Satish *et al.* (2018)^[41] opined that the highest values of plant height (129.21 cm at maturity), leaf area index (3.21 at 90 DAS), number of effective tillers (115.67/m at maturity) were recorded under one hand weeding at 20 DAS *fb* two inter-culture at 30 and 45 DAS in direct seeded finger millet. Kujur *et al.* (2019)^[16] revealed that number of tillers, LAI, dry

matter accumulation, crop growth rate were significantly higher under hoeing twice by wheel hoe between rows and intra-row manual weeding at 20 and 40 and hand weeding twice at 20 and 40 DAS. In transplanted finger millet, application of PE bensulfuron methyl 60 g/ha + pretilachlor 600 g/ha *fb* EPOE bispyribac sodium 25 g/ha enhanced the growth attributes like plant height, total tillers/m², DMP, LAI and it was comparable with HW at 15 and 30 DAT (Shanmugapriya, 2019)^[42, 43].

Effect of IWM on yield attributes and yield

Pre emergence application of oxyfluorfen 0.1 kg/ha *fb* two inter cultivation gave higher yield attributes and yield in finger millet (Yaduraju and Mishra, 2004). Kumara *et al.* (2007)^[18] concluded that the yield attributes were higher under weed management practices over weedy check though the thousand seed weight were unaffected by weed management practices and ranged in between 2.08 to 3.00 g. In finger millet, pre-emergence application of oxyfluorfen at 0.05 lit/ha along with two inter cultivations and one hand weeding recorded higher grain and straw yields (2682 and 5445 kg/ha) as compared to unweeded check (168 and 760 kg/ha) (Anon, 2007)^[2].

Pradhan *et al.* (2010)^[30, 31] found that the two hand weeding at 20 and 45 DAS with higher dose of oxyfluorfen (0.50 kg/ha) resulted in the highest grain yield, straw yield and harvest index of finger millet. Prashanth kumar (2014)^[33] reported that pre-emergence application of bensulfuron methyl (0.6% G) + pretilachlor (6.0% G) at 7.5 kg/ha (pre-mix formulation) recorded higher yield components *viz.*, productive tillers/hill, ear head length, ear head weight, finger length and 1000 grain weight in drill sown finger millet..

Kujur (2016)^[40] found that oxyfluorfen at 0.075 kg/ha + one hand weeding significantly enhanced the number of seeds per finger and finger weight of finger millet. Satish *et al.* (2018)^[41] opined that the highest values of ear weight (11.65 g), ear length (8.74 cm at maturity) and grains per earhead (1031.67), higher grain and straw yield (3496 and 6164 kg/ha) were recorded under one hand weeding at 20 DAS *fb* two inter-culture at 30 and 45 DAS in direct seeded finger millet. Kujur *et al.* (2019)^[16] revealed that grain yield was significantly higher under hoeing twice by wheel hoe between rows and intra-row manual weeding at 20 and 40 and hand weeding twice at 20 and 40 DAS. In transplanted finger millet, the highest grain and straw yield of 3560 and 6617 kg/ha, were recorded by PE application of bensulfuron methyl 0.6 G at 60 g/ha + pretilachlor 6 G at 600 g/ha *fb* EPOE application of bispyribac sodium 10 SC at 25 g/ha and it was on par with hand weeding on 15 and 30 DAT (3443 and 6353 kg/ha) (Shanmugapriya *et al.*, 2019)^[42, 43].

Effect of weed control on nutrient uptake by finger millet

Banu (2014)^[5] found that PE bensulfuron methyl + pretilachlor at 10 kg/ha registered higher nutrient uptake in transplanted finger millet. Prashanth kumar (2014)^[33] found that PE bensulfuron methyl + pretilachlor at 7.5 kg/ha recorded higher nutrient uptake in finger millet. Kujur *et al.* (2019)^[16] reported that hoeing twice by wheel hoe between rows and intra row manual weeding which was at par with hand weeding at 20 and 40 DAS resulted in increased utilization of nutrients, moisture, space and light hence produced more dry matter production. Application of PE bensulfuron methyl 60 g/ha + pretilachlor 600 g/ha *fb* EPOE bispyribac sodium 25 g/ha registered higher nutrient uptake (NPK) by finger millet (Shanmugapriya, 2019)^[42, 43]. Pavitra

et al. (2019) reported that the application of 125% N along with PE oxyfluorfen 50 g/ha+ EPOE bispyribac sodium 25 g/ha improved the NPK uptake and nutrient recovery efficiency during flowering and harvesting stages of finger millet in sodic soil.

Effect of weed control on nutrient removal by weeds

In finger millet, higher nutrient removal by weeds was registered under unweeded control as against the lowest removal in weed free plot which was observed by Nanjappa *et al.* (1987)^[23]. Uma *et al.* (2014)^[46] observed that bensulfuron methyl + pretilachlor *fb* bispyribac sodium registered lower nutrient removal by weeds and it was on par with hand weeding at 20 and 40 DAT. Kumar *et al.* (2015)^[17] found that nutrient removal by weeds were lower with PE bensulfuron methyl + pretilachlor at 10 kg/ha in drill sown finger millet. Kujur *et al.* (2019)^[16] reported that hoeing twice by wheel hoe between rows and intra row manual weeding which was at par with hand weeding at 20 and 40 DAS resulted in lower weed density and weed biomass caused lower nutrient removal by the weeds. Varnekar *et al.* (2019)^[47] found that unweeded control recorded severe weed competition exerted by grasses, sedges and broad-leaved weeds which resulted in higher nutrient removal by weeds throughout the growth period. Application of PE bensulfuron methyl 60 g/ha + pretilachlor 600 g/ha *fb* EPOE bispyribac sodium 25 g/ha registered lower nutrient removal by weeds (Shanmugapriya, 2019)^[42, 43].

Effect of weed management on economics

Kumara *et al.* (2007)^[18] reported that the herbicides are economical and cost effective in managing weeds during initial stages as compared to hand weeding. Pradhan *et al.* (2010)^[30, 31] observed that the PE oxyfluorfen at 0.25 kg/ha + one hand weeding at 20 DAS realized maximum BC ratio (2.07) followed by PE oxyfluorfen at 0.25 kg/ha + two hand weeding at 20 and 45 DAS (1.97) and PE oxyfluorfen at 0.15 kg/ha + two hand weeding at 20 and 45 DAS (1.89). Among different weed management practices, higher BC ratio (1.81) was found in pre emergence application of oxyfluorfen at 0.50 kg/ha, owing to higher weed control efficiency.

In finger millet, pre-emergence application of oxyfluorfen at 0.05 lit/ha along with two inter cultivations and one hand weeding recorded higher B:C ratio (2.89) as compared to unweeded check (1.16) (Anon, 2007)^[2]. Prasad *et al.* (2010)^[32] stated that a saving of weeding cost to an extent of Rs.6810 to 6980/ha was observed in finger millet by using herbicides as compared to hand weeding. Sunil *et al.* (2011) revealed that application of bensulfuron methyl + pretilachlor (6.6 GR) at 0.06 + 0.60 kg a.i. /ha + one inter cultivation at 40 DAS recorded maximum net returns (25193 Rs./ha) and higher benefit cost ratio (2.29). Kumar *et al.* (2013) revealed that application of bensulfuron methyl + pretilachlor (6.6 GR) at 0.06 + 0.60 kg a.i./ha recorded maximum gross returns (Rs. 44222/ha), net returns (Rs. 27754/ha) and higher benefit cost ratio (2.69). Dhanapal *et al.* (2015)^[10] reported that saving in weeding cost to an extent of Rs. 6810 to Rs. 6980 per hectare in finger millet was realized by using herbicides as compared to hand weeding.

Satish *et al.* (2018)^[41] revealed that the Bensulfuron methyl + pretilachlor at 3 kg/ha (pre-mix formulation) as pre-emergence application *fb* one inter-culture at 45 DAS had reduced cost of cultivation (73.74%) compared to one hand weeding at 20 DAS *fb* two inter-culture at 30 and 45 DAS. Kujur *et al.* (2019)^[16] reported that maximum gross return,

net monetary return and BC ratio was recorded under hoeing twice by wheel hoe between rows and intra-row manual weeding followed by two hand weeding at 20 and 40 DAS. In transplanted finger millet, The highest gross return, net return and BCR of Rs.74508/ha, Rs.44572/ha and 2.49, respectively were recorded in PE application of bensulfuron methyl at 60 g/ha + pretilachlor at 600 g/ha fb EPOE bispyribac sodium at 25 g/ha (Shanmugapriya, 2019)^[42, 43].

Conclusion

Initial growth period of finger millet are more prone to severe weed competition due to the morphological similarity which makes us difficult to distinguish some grassy weeds from finger millet. Deficit or excessive soil moisture plays a major role in reducing the efficiency of weeding. In addition to that, the scarcity of human labour at critical period of weed competition makes it impossible for timely weed control in finger millet. Relying on herbicides may be the best choice of labour saving technology for timely weed control. So combination of herbicide along with commonly used weed control methods as an integrated approach may be the best suited alternative for efficient weed control in finger millet.

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