IMPACT OF VARIOUS ORGANIC AND CULTURAL PRACTICES ON YIELD AND WEED MANAGEMENT IN OKRA (*Abelmoschusesculanta* L.)

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ABSTRACT

Weed management in okra is one of the challenging and expensive steps that ultimately result in reducing the productivity. A field experiment was conducted to evaluate**the**impact of various organic and cultural practices on yield and weed management in okra at the Agronomy Research Farm of The University of Agriculture, Peshawar, Pakistan during spring season 2021 in a Randomized Complete Block Design (RCBD). The following treatments were applied in the trial. Parthenium(*Partheniumhysterophorus*) weed extraction (120g.L^{-1}), Coco grass (*Cyperusrotundus*) weed extraction (120g.L^{-1}), Field bind weed (*Convolvulus arvensis*) weed extraction (120g.L^{-1}), mulching (Eucalyptus leaves), mulching (News Paper), hand weeding (Once) 20 days after sowing (DAS), hand weeding (Twice) 20 &40 DAS, and a weedy check. Results showedthat all the studied parameters of okra crop except the number of flowers perplantwere significantly affected by the applied treatments. Maximum weed fresh biomass (143.3g), weed dry biomass (42.2g), plant height (64.2cm), number of branches per plant (11), fruit length (11.73 cm), fruit diameter (1.8 cm) and yield (3246.6kg. ha^{-1}) were noted in hand weeding (Twice) 20- & 40DAS followed by hand weeding (Once) 20 DAS;however, minimum values were noted in weedy check treatment, except weed density which was found maximum in weedy check plots. In conclusion, hand weeding twice 20 & 40 DAS is recommended in order to get best yields of okra.

Keywords: Okra, weeds, weeds extract, mulching, hand weeding

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INTRODUCTION

Okra (*Abelmoschusesculentus* L.) is the most popular and grown all over the world vegetable (Naveed *et al*, 2009). In Urdu and Hindi, it is known as "Bhindi", while in Pashto. called "Bindi". It is mainly cultivated for its green fruits which used as salads or fried in hot oil or cooked. Okra fruit play a vital role in human diet as it has protein, starch and various vitamins like, A, B complex and K, while in minerals rich in calcium, iron, and phosphorus (Whitaker, 2001 and Srinivasan 2009).

In past, okra plant was included in Hibiscus genus but now in the Abelmoschus and belongs to the Malvaceae family (Aladele*et al.,* 2008). In top 10 okra producing countries, India stood first, while Pakistan 5th in ranking;inPakistan okra is cultivated over an area 14.9 thousand hectares with a total production of 123 thousand tones; while inKPK,itis grown over an area of two thousand hectaresandthe total production is 16 thousand tones,Punjab produces 62.5 thousand tones over an area of 5.6 thousand hectares,whilein Sindh production is higher than Khyber Pakhtunkhwa, however it is lower than Punjab, i.e., 18.2 thousand tones over an area of 4.6 thousand hectare;onthe other hand, Baluchistan is share 16.5 thousand tones, cultivated on 2.6 thousand hectares (MNFSR, 2019).

In Pakistan,okra production is lower as compared with developed countries. There are several reasons of low yield i.e., area under cultivation, water stress, soil fertility, weeds, diseases and arthropod pests (Dhaliwal, 2004). Oerk(2005) stated that losses due to weed is about (34%) which is less compared to plant pathogen and animal pests causing losses of 16% and 18%.

Okra was cooked for flavoring because of the high mucilaginous content in the pods.Itis cultivated commercially for their immature fruits and can be consumed fresh and canned as well as for their seed purpose. Itis considered as a high nutritional vegetable in many developing countries and use as a complement to meet the alimentary imbalance. Itis also the best source of vitamin A, B, C and is also a rich of protein, fats, carbohydrates, iron, iodine and minerals (Aykroyed., 1963).

Mulches help to increase the plant growth by improving soil structure by lowering the soil bulk density.For better plant growth Less- compacted soil provides a much better atmosphere for seed plant emergence. Mulches are useful for reduce soil from erosion thanks to the downfall. As a result of there's no direct contact of raindrops with the soil and having terribly less likelihood of eroding. The upmost soil is more fertile in comparison to lower soil. Mulches are useful to prevent the nutrients from leaching. (Kumara and Dey, 2011).

Objectives:

- To find out the best management techniques to improve the yield and quality of okra crop.
- To compare all the applied treatments for the control of weeds in okra.

MATERIALS AND METHODS

This experiment was conducted at Agriculture Research Farm, The University of Agriculture, Peshawar, Pakistan during spring season 2021.The experiment was carriedout in Randomized Complete Block Design (RCBD) having eight treatments with three replications. Eight treatments were applied with sub plot size was 3×2 m^2. Each plot comprised five rows. In each row there were 20 plants.Therow-to-row distance was kept 50 cm apart, while the plant-to-plant distance was 15 cm. The field was ploughed thoroughly with the disc plough and cultivator for breaking of

the clods before the seeds sowing. Hoeing, irrigation and other culture practices were carried out at regular basis for each treatment.

TREATMENTS AND THEIR DETAILS

Table 1.

#	Treatments	Rate
1	Parthenium weed extraction	120g.L^{-1}
2	*Cyperusrotundus* weed extraction	120g.L^{-1}
3	*Convolvulusarvensis* weed extraction	120g.L^{-1}
4	Mulching	Eucalyptus leaves
5	Mulching	News Paper
6	Hand weeding(Once)	20 days after sowing
7	Hand weeding(Twice)	20 and 40 days after sowing
8	Weedy check	(Control)

Parthenium, *Cyperusrotundus*, *Convolvulus arvensis* plants were collected from the farmofthe University of Agriculture Peshawar, then chopped and kept on cemented floor for shade drying. Then the samples were kept in an electric oven on 70 ^{0}C for 48 hrs to dry completely, then the dried residue were crushed in a grinder to powder form and 120g.L^{-1} were put in drum for 24 hrs and were passed through a muslin cloth.

RESULTS AND DISCUSSION

Weeds density before treatment application

Data regarding weeds density $^{-2}$ in okra field as affected by various environment friendly treatments (table2). Weed density is significantly affected by all the treatment applied to the experimental trials. According to the results maximum weeds density before treatment application were noted in Mulching (newspaper) (150.4) which were statistically followed by Mulching (Eucalyptus leaves) (147.2), coco grass (*cyprusrotundus*) (146.5),parthenium weed extract (120g/l)(143.4),field bind weed (*convolvulus arvensis*) weed extract (120g.l^{-1}) (138.3), however the lowest weed density was noted in weedy check (control) (130.4).

Table 2. Weeds density $^{-2}$before treatment application in okra field

Treatments	Means
T1=Parthenium (*Partheniumhysterophorus*) weed extraction (120g/L)	143.4d
T2= Coco grass (*Cyperusrotundus*) weed extraction (120g/L)	146.5c
T3= Field bind weed (*Convolvulus arvensis*) weed extraction (120g/L)	138.3e
T4= Mulching (Eucalyptus leaves)	147.2b
T5= Mulching (News Paper)	150.4a
T6= Hand weeding (Once) 20 days	135.5f
T7= Hand weeding (Twice) 20 and 40 days	133.1g
T8= Weedy check (control)	130.4h

LSD = 1.32

Weeds density after treatment application

Results showed maximum weeds in control plots (125) which were statistically followed by Parthenium (*Partheniumhysterophorus*) (117.6) weed extraction (120g/L) treated plots, (*Cyperusrotundus*) (114.8) weed extraction (120g/L), Field bind weed (*Convolvulus arvensis*) weed (112.1) extraction (120g/L) and Mulching (Eucalyptus leaves) (110.4) (Table 3) however the lowest weeds density was noted in twice hand weeding (65.6) plots. Hand weedinggave better results in suppressing weed populationinokra as compared to Crop mulching. The reason for this could be the complete rouging of weed flora and covering of soil surface, from the planting onwards and hence restricting the appearance of weeds.Our results are similar to the findingsofRehman*et*al. (2017)foundthat hand weedingis a better option for breaking the life-cycle of weeds than soil cover (mulches) inhibit the weed seed germination by preventing the sunlight.

Table 3. Weeds density after treatment application in okra field as affected by various environment friendly treatments.

Treatments	Mean
T1=Parthenium (*Partheniumhysterophorus*) weed extraction (120g/L)	117.6a
T2= Coco grass (*Cyperusrotundus*) weed extraction (120g/L)	114.8a
T3= Field bind weed (*Convolvulus arvensis*) weed extraction (120g/L)	112.1a
T4= Mulching (Eucalyptus leaves)	110.4a
T5= Mulching (News Paper)	118.1ab
T6= Hand weeding (Once) 20 days	93.4b
T7= Hand weeding (Twice) 20 &40 days	65.6c
T8= Weedy check (control)	125a

LSD= 11.53

Dry weight (g)

Data pertaining dry weight (g) of okra as affected by various environment friendly treatment are displayed in table (4). Dry weight of okra crop is significantly affected by all the applied treatment in the field. Manual hand weeding twice each after 20 and 40 days produced maximum wet weight (42.8g) followed by one time hand weeding (37.4g) and newspaper mulching (33.9g), while the lowest dry weight of okra crops was noted in a Coco grass (*Cyperusrotundus*) weed extraction (120g/L) (21g) which was statistically similar to that of Parthenium (*Partheniumhysterophorus*) weed extraction (120g/L) (26) and weedy check plots. The minimum percentage of weeds might be the reason for maximum dry weight of okra crop.The result of the present study is in line with the findings of Barla et al. (2016) who also reported the less weed density in manual hand weeding plots and mulched plot was found to be responsible for maximum dry weight of okra crop.

Table 4. Dry weight of okra as affected by various environment friendly treatment.

Treatments	Mean
T1=Parthenium (*Partheniumhysterophorus*) weed extraction (120g/L)	26.23cd
T2= Coco grass (*Cyperusrotundus*) weed extraction (120g/L)	21.26d
T3= Field bind weed (*Convolvulus arvensis*) weed extraction (120g/L)	32.56bc

T4= Mulching (Eucalyptus leaves)	26.3cd
T5= Mulching (News Paper)	33.96b
T6= Hand weeding (Once) 20 days	37.4ab
T7= Hand weeding (Twice) 20 &40 days	42.81a
T8= Weedy check (control)	27.2cd

LSD=4.27

Pod length (cm)

Data revealed pod length (cm) of okra crop as affected by various environment friendly treatments (Table.4). pod length (cm) is significantly affected by all the treatment applied to the experimental trials. According to the results maximum pod length (cm) was noted in Mulching (News Paper) (11.73 cm) which was statistically followed two-time hand weeding (11.1cm) and one-time hand weeding (10.56 cm); however, the lowest pod length was noted in weedy check treatment (8.1 cm). This might be due to better nourishment of plants under less competitive environments with lower weeds population produced bolder seeds ultimately improved the girth of the pod. Similar results were obtained by Khan and Jaiswal (1988) who reported that the longest and maximum girth pods were obtained from plants spaced at 45cm × 30cm, receiving maximum nutrients with less weeds competition.

Table 5. Pod length (cm) of okra crop as affected by various environment friendly treatment.

Treatments	**Mean**
T1=Parthenium (*Partheniumhysterophorus*) weed extraction (120g/L)	9.033cd
T2= Coco grass (*Cyperusrotundus*) weed extraction (120g/L)	10.23abc
T3= Field bind weed (*Convolvulus arvensis*) weed extraction (120g/L)	9.433cd
T4= Mulching (Eucalyptus leaves)	9.633bcd
T5= Mulching (News Paper)	11.73a
T6= Hand weeding (Once) 20 days	10.56abc
T7= Hand weeding (Twice) 20 &40 days	11.16ab
T8= Weedy check (control)	8.1d

LSD= 1.09

Number of branches

Data revealed number of branches of okra crop as affected by different environment friendly treatments shown in (Table65). Number of branches is significantly affected by all the treatment applied to the experimental trials. According to the results maximum number of branches were noted in Hand weeding (Twice) 20 &40 days (11.3) statistically followed by Hand weeding (Once) 20 days and Mulching (News Paper) however the least number of branches were counted in weedy check treatment (8.3) followed non-significantly by Coco grass (*Cyperusrotundus*) weed extraction (120g/L) and Parthenium (*Partheniumhysterophorus*) weed extraction (120g/L) treatments. It can be assumed that plants grown in wider spacing had less competition for moisture and light as compared with closer spacing. Thus, the lateral growth of the plant has been favored and tends to produces plants with more lateral branches at wider spacing. In 2003, Wu et al. reported that the decrease in number of branches as plant population density increased. The increment in number of branches produced in each plantin response to the

lower plant population is reported by Ekwu and Nwokwu (2012).

Table 6. Number of branches of okra as affected by various environment friendly treatment.

Treatments	Mean
T1=Parthenium (*Partheniumhysterophorus*) weed extraction (120g/L)	9.6d
T2= Coco grass (*Cyperusrotundus*) weed extraction (120g/L)	9d
T3= Field bind weed (*Convolvulus arvensis*) weed extraction (120g/L)	10.6bcd
T4= Mulching (Eucalyptus leaves)	9.33cd
T5= Mulching (News Paper)	11ab
T6= Hand weeding (Once) 20 days	11.3a
T7= Hand weeding (Twice) 20 &40 days	11.3a
T8= Weedy check (control)	8.3d

LSD= 1.01

Plant height (cm)

Data revealed plant height (cm) of okra crop as affected by various environment friendly treatments shown in (Table 7). Plant height (cm) of okra crop is significantly affected by all the treatment applied to the experimental trials. Our finding indicates that maximum plant height of okra crop was noted in Hand weeding (Twice) 20 &40 days (64.5cm) statistically followed Field bind weed (*Convolvulus arvensis*) weed extraction (120g/L) (58.77)Parthenium (*Partheniumhysterophorus*) weed extraction (120g/L) (54.42 cm) by Hand weeding (Once) 20 days (53.55cm) however the least plant height (cm) was counted in control treatment (52.3 cm) followed non-significantly by Coco grass (*Cyperusrotundus*) weed extraction (120g/L) and Parthenium (*Partheniumhysterophorus*) weed extraction (120g/L) treatments.This result is supported by the finding of Attardeet. al., (2012) who stated that maximum plant height in okra was found to be increased with increase in nutrients rates. The spacing in okra crop was also found significantwith maximum height except at 30 DAS which is according to the findings of Arora, et al., (1987) that crowded plants begin to grow upward to receive light, rather than developing laterally.

Table 7. Plant height (cm) of okra as affected by various environment friendly treatment.

Treatments	Mean
T1=Parthenium (*Partheniumhysterophorus*) weed extraction (120g/L)	54.42bc
T2= Coco grass (*Cyperusrotundus*) weed extraction (120g/L)	50.6c
T3= Field bind weed (*Convolvulus arvensis*) weed extraction (120g/L)	51.40c
T4= Mulching (Eucalyptus leaves)	58.77ab
T5= Mulching (News Paper)	51.44c
T6= Hand weeding (Once) 20 days	53.55bc
T7= Hand weeding (Twice) 20 &40 days	64.5a
T8= Weedy check (control)	52.3bc

LSD=4.52

Okra yield (kg ha^{-1})

The following Table-8 indicatesthedata pertaining to okra yield (kg.ha^{-1})as affected by the various environment friendly treatments used in the experiment. According to the statistical analysis, okra yield is significantly affected by all the treatments applied in the experimental units. The results showedthat maximum okra yield was obtained in plots where weeds were rouged out manually by hand weeding (Twice) 20 &40 DAS(3246.6 kg.ha^{-1}), followed by hand weeding (Once) 20 days (2197.2 kg ha^{-1}); however, minimum okra yield was obtained in weedy check (1256.6 kg.ha^{-1}), followed non-significantly by *Cyperusrotundus* weed extraction (120g/L) and *Convolvulus arvensis*weed extraction (120g/L) treatments.Optimum plant population provides efficient utilization of resources thus increasing the growth and yield component of plant-like pod diameter, length and pod weight of plants which contributes to pod fresh weight yield (Abeykoon et al., 2011). The total yield mainly depends upon the yield plant^{-1} and plant population. Therefore, closer spacing up to a particular limit produces higher yields due to a greater number of plants per hectare. Wider spacing leads to a lower number of plants per hectare and ultimately lower yields. The probability of producing higher green fruit yield per hectare with a higher density has been reported by Singh (1990). However, as a rule, all crops tend to extend yield as plant population density increased, but only up to a particular limit (AVRDC, 1990).

Table 8. Okra yield kg ha^{-1} of okra as affected by various environment friendly treatment.

Treatments	Mean
T1=Parthenium (*Partheniumhysterophorus*) weed extraction (120g/L)	1785bcd
T2= Coco grass (*Cyperusrotundus*) weed extraction (120g/L)	1587.2cde
T3= Field bind weed (*Convolvulus arvensis*) weed extraction (120g/L)	1287.22de
T4= Mulching (Eucalyptus leaves)	1945bc
T5= Mulching (News Paper)	1683.3cde
T6= Hand weeding (Once) 20 days	2197.2b
T7= Hand weeding (Twice) 20 &40 days	3246.6a
T8= Weedy check (control)	1256.6e

LSD=321.94

CONCLUSIONS AND RECOMMENDATIONS

All the studied parameters of okra crop were significantly affected by almost all the applied treatments.Okraflowering numbers were found non-significant amongst all the treatments.Maximum okra yield (3246.6 kg.ha^{-1}) was obtained under plots of hand weeding (twice).Hand weeding (twice) 20 & 40 days after crop sowing, could render better yields and production; however, hand weeding is considered as ecofriendly for okra crop under the agro climatic condition of Peshawar.

LITERATURE CITED

Abeykoon, A., R. Fonseka, S. Paththinige and K. Weerasinghe. 2011. Fertilizer requirement for densely planted okra [*Abelmoschusesculentus* (L.) Moench]. Trop. Agric. Res. 21(3): 275.

Aladele, S.E., O.J. Ariyo and R.de. Lapena. 2008. Genetic relationships among West Africanokra (*Abelmoschuscailli*) and Asian genotypes (*Abelmoschusesculentus*) using RAPD. Afr. J. Bot. 7: 1426-1431.

Arora, S.K., P. Pratap, M. Pandita and I. Jalal. 1987. Production problems and their possible remedies in vegetable crops. Indian Horti. 32.

AVRDC. 1990. Vegetable-Production Training Manual, 447. Asian Vegetable Research and Development Center, Shanhua, Taiwan.

Aykroyed, W.R. 1963. Amaranths In: Bose, TK and MG Som. Vegetable Crops India. NayaProkash, Calcutta Six, India.

Barla, S., R.R. Upasani, A.C. Pandey and S.S. Kumar. 2016. Weed management through green manuring in direct-seeded rice (*Oryza sativa*) under medium land condition at East Singhbhum District of Jharkhand, India. Ecology Environment and Conservation 22(4): 227-230.

Dhaliwal, G.S. 2004. Agricultural pests of South Asia and their management. Kalyani Publishers, Ludhiana, New Delhi-Noida (U.P) Hyderabad Channai Kolkata, India. Pp. Slovenica. 91(1): 15-22.

Ekwu, L.G. and G.N. Nwokwu. 2012. Effect of plant spacing and planting date on the growth and yield of okra [*Abelmoschusesculentus* (L.) Moench] in Abakaliki. Intl J. Agri. and Rural Dev. 15(2): 1041-1048.

Khan, A.R. and R.C. Jaiswal. 1988. Effect of nitrogen, spacing and green fruit pickings on the seed production of okra [*Abelmoschusesculentus* (L.) Moench] Vegetable Sci.15(5): 8-14.

Kumar, S. and P. Dey. 2011. Effects of different mulches and irrigation methods on root growth, nutrient uptake, water-use efficiency and yield of strawberry. *Scientia Horticulturae*, *127*(3): 318-324.

MNFSR. 2016. Fruits, Vegetables and Condiment Statistics of Pakistan Govt. of Pakistan, ministry of National Food Security and Research Islamabad Pp. 11-20.

Naveed, A., V.F. Khan and I.A. Khan. 2009. Generation mean analysis of water stress tolerance in okra (*Abelmoschusesculentus* L.). Pak. J. Bot. 41: 195-205.

Oerke, E.C. 2005. Crop losses to pests. J.Agr. Sci. 144: 31-43.

Ofor, M.O., I.I. Ibeawuchi and A.M. Oparaeke. 2009. Crop Protection Problems in Production of Maize and Guinea Corn in Northern Guinea Savanna of Nigeria and Control Measures. Nature and Sci. 7 (11): 45-51.

Rahman, M.M. 2017. Weed Management in conservation agriculture. Advances in Plants and Agricultural Research 7(3): 00253

Sharma, S. and D.P. Sharma. 2019. Weed management in stone fruit nectarine orchard with inorganic mulches and herbicides. Indian J. Weed Sci. 51(1): 45-49.

Singh, B.P. 1990. Effect of spacing on okra. Indian J. Agro.35: 439- 441.

Singh, A. and S. Sarkar. 2020. Impact of Straw and Polyethylene Sheet Mulching onthegrowth and Yield of Okra-A Review. *European Journal of Molecular & Clinical Medicine*, *7*(07): 413-419.

Srinivasan, R. 2009. Insect and mite pests on eggplant: a field guide for identification and management. Avrdc the world vegetable center, Shanhua, Taiwan. 09:729:64.

Whitaker, J.M. 2001. Reversing diabetes. New York: Warner Books Inc. 446.

Wu, Y.B.A., N.O. Kahn, J.B. Maness, R.W. Solie, R.W. Whitney and K.E. Conway. 2003. Densely planted okra for destructive harvest: Effects on plant architecture. Horti. Sci. 38(7):1365-1369.