RESPONSE OF BITTER GOURD (*Momordica charantia*) TO CULTURAL AND CHEMICAL WEED CONTROL METHODS

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DOI: https://doi.org/10.28941/pjwsr.v26i3.851

ABSTRACT

During 2012 and 2013, two field trails were undergone in the farm fields of Agricultural University Peshawar to assess the influence of various weed management methods in bitter gourd. The treatments comprised of four mulches (i.e. Rumex crispus, Silybum marianum, newspaper as mulch, and saw-dust as mulch), a herbicide i.e. Stomp 330 EC (pendimethalin) applied as pre-emergence. For comparison of the treatments with weed free and weedy conditions, a hand weeding and a weedy check (control) treatment were also kept. Data were collected on weeds fresh biomass, number of plants ha^{-1} and fruit weight. The results showed significant effect for all the parameters during both years. Weed biomass was the highest (2971 and 3595 kg ha^{-1}, respectively) in weedy control treatments, and lowermost in the hand weeded treatments (68 and 83 kg ha^{-1}) in 2012 and 2013, respectively. Moreover, the effect of the mulching treatments and the herbicidal treatments were statistically quite close to each other but significantly different from the control plots. The highest number of plants ha^{-1} (9773 and 8077) and highest fruit weight plant^{-1}(756 and 657 g) were found in the weed free (hand weeded) treatments in 2012 and 2013, respectively. However, the weed free treatment (hand weeding) was closely followed by the herbicide, Stomp 330 EC with the respective values in the two years as 8834 and 7301 plants ha^{-1}, and 667 and 580 g plant^{-1} in 2012 and 2013, respectively. Moreover, the performance of the mulching treatments was also significantly more effective than the weedy check plots. Mulches of S. marianum and R. crispus reduced the weed biomass to 1072 and 1615 kg in 2012 and 1297 and 1954 kg in 2013 as compared to the weedy control with weed biomass of 2971 and 3595 kg ha^{-1} in 2012 and 2013, respectively. The respective no. of plants ha^{-1} for the mulches of S. marianum and R. crispus were 8548 and 8489 in 2012 and 7065 and 7016 in 2013 whereas and the fruit weight plant^{-1} was 435 and 396 in 2012 and 378 and 344 g in 2013. Keeping in view the good performance of weed biomass as mulches, the cost of production and the environmental safety, the hand weeding and herbicide use cannot be preferred alone for use as weed management tools. Therefore, the herbicide use and hand weeding should be used only on casual basis or in emergency; and the mulching methods should be adopted in the long run as mulching method is not only good for weed control but also for maintaining the soil fertility, moisture conservation, and environmental safety.

Keywords: Bitter gourd, herbicide, *Momordica charantia*, mulching, weeds.

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Citation: Luqman, Z.Hussain, M.Ilyas, A.A. Awan. J. Rahman, M. Ali, T. Bakht. 2020. Response Of Bitter Gourd (Momordica Charantia) To Cultural And Chemical Weed Control Methods. *Pak. J. Weed Sci. Res., 26(3): 343-347, 2020*

Introduction

Bitter gourd (*Momordica charantia* L.) is a well-known vegetable grown worldwide, particularly famous for its edible fruit in the tropical areas (El-Batran *et al*., 2006). The major producing area is in Africa (Joseph, 2005). Bitter gourd has oblong, small cucumber like fruit, that is green at young stage and adopt orange-yellow color at ripening (Saeed *et al*., 2010). In Pakistan bitter gourd was produced on a area of about 6080 ha in 2008-09 that gave an yield of 56239 t, while in Khyber Pakhtunkhwa area of production was 894 ha that yield 6483 t (GOP Ministry of Food & Agric., 2008-09).

In spite medicinally importance and has economical potential, the crop give less yield. There would be a lot of factors responsible for the lower yields, like reduced acreage under production without even considering insufficient pollination. However, the obscure impact of weed competition cannot be ignored, as vegetables are always quite vulnerable to weed interference (Ahmad *et al.*, 2014). According to (Webseter, 2006), Important troublesome cucurbits weeds include common cocklebur, Bermuda grass, nut sedges, horse nettle, pigweeds, morning glories, rag weeds. Cucurbits are mostly free from weed at first weak after planting (Noble, 2009). Weed infestation increases with increases in maturation period by increasing seed setting (Stall, 2009). Weed seedling can be controlled in plants through hilling-up at the stage, when vines have not yet begun to run out. Cultural weed control practices need to be encouraged in vegetable crops like tomato, bitter gourd etc. (Bakht *et al*., 2014).

The project was organized with the objectives to explore the impact of some cultural weed control techniques on weeds growth and population, to judge the effects of diverse mulches on crop yield, to compare the efficacy of hand weeding with mulching treatments, weedy check and a herbicide, and to develop an eco-friendly weed management package to boost the crop growth in the long run.

Materials and Methods

Research on testing the various weed control methods in the bitter gourd vegetable cultivated in the climatic circumstances of the region of Peshawar was undergone in the farm fields of Agricultural University Peshawar, in the years of 2012 and 2013. Experiments were organized in RCBD (randomized complete block design) keeping a total of four replications. Seven different treatments were used in the experiments that included four different mulching treatments. There were mulches of *Rumex crispus*, *Silybum marianum*, news papers and saw dust; along with the treatment of Stomp 330 EC (pendimethalin) as pre-emergence herbicide, a control and hand weeding for comparison.

All cultural practices were carried out according to the crop requirements. The land was prepared and bitter gourd was sown in the month of March in both the years. The seeds of local recommended variety (Indian karela) were sown keeping the plot size of 3m × 3m. Moreover, the seeds were sown on the sides of the ridges up to 2-2.5 cm deep, keeping the p-to-p as 30 cm distance. Ridges were made in the direction of east to west. The recommended dose of nitrogen @ of 60 kg ha^{-1} was applied. The application of DAP fertilizer was done before the sowing of crop and nitrogen application was conducted after the sowing process as per standard requirements. The crop was irrigated according to its requirements. During the course of the research, the parameters studied were fresh weed biomass, number of bitter gourd plants ha^{-1}, and fruit weight.

Statistical Analysis

Data analyses were carried out by the statistical software Statistix 8.1 and MS Excel 2007 using the RCB design and the LSD tests were undergone for the significant parameters.

Results and Discussion

Weed biomass (kg ha^{-1})

It is cleared from the data in Table-1 that year and weed control treatments significantly affected weed biomass. Data exhibited that maximum weed biomass of 2971 and 3595 kg ha^{-1} in 2012 and 2013, respectively plots with weedy check; while minimum biomasses (68 and 83 kg *ha^{-1}*) that were noticed in the weed free treatments of hand weeding during 2012 and 2013, respectively followed by stomp 330 EC (495 and 598, kg ha^{-1}). The weed biomass is directly proportional to the weed density that is the higher the density the higher the biomass and vice versa. That is why the weedy check plots resulted in highest weed biomasses than other treatments. The results are correlated with those of Rao (2000), who reported a loss of one kg in the biomass of crop with production of 1 kg weed biomass. Mulching has a smothering effect on weeds by restricting photosynthesis and thus inhibiting top growth (Jayakumar and Jagannathan, 2007). One of the main advantages of mulches is the suppression of weed growth, thereby eliminating the need for inter cultivation of soil. Plastic mulches are found to offer satisfactory weed control in cotton and in vegetables.

Number of plants ha^{-1}

Data in Table 1 revealed a significant effect of years and weed control methods on number of plants ha^{-1}. The no. of plants ha^{-1} was got higher in 2012 (8250) than in 2013 6818). (More plants ha^{-1} (9772 in 2012 and 8077 in 2013) were produced in hand weeding area while less plants ha^{-1} (5891 and 4868) were noticed in plots with control treatment during both years. In hand weeding, there was more space and nutrients available for plants than weedy check. Though of plants ha^{-1} was kept constant at the sowing time; however, this parameter could not remain the same in the later season.

Fruit weight plant^{-1}

The ANOVA exhibited that year and treatments significantly affected the weight of fruit plant^{-1} (in grams). Looking at the means, it was thus indicated that the highest fruit weight of 756 and 657 g plant^{-1} in 2012 and 2013, respectively were noted in plots of hand-weeding that were at par statistically with the herbicide treatment of pendimethalin (667 and 550 g plant^{-1} in the years of 2012 and 2013, respectively). Minimum fruit weight of 257.5 and 223 g plant^{-1} were recorded in control treatments in both of the years, respectively. The higher weed competition in weedy check plots reduced the fruit weight plant^{-1} in the plots. These findings are in close connection with the findings of Sonsteby *et al.* (2004), and Cadavid *et al*. (1998) who also reported an increase in soil available potassium and phosphorous with the application of grass and straw as mulch. Similarly, Sharma and Sharma (2003) and Singh *et al*. (2007) recorded improvement in growth, quality, and yield of plants with mulching. Abak *et al*., (1991) reported that average fruit weight was 880 g in mulch plantations while it was only about 762 g in control plantations.

Conclusion

The results indicated that weed competition does have an influence on bitter gourd crop. The hand weeding had the best results in reduction of weeds and improvement in yield, but it is a much laborious method. The mulches closely followed the hand weeding and the herbicide treatments. This is a good indicator of decreasing blind reliance on use of chemicals for weed control. Thus, for better weed management in vegetables, mulches are essential in future. Mulching can prove the best eco-friendly control of weeds in improving crop growth and sustaining environmental safety in the long run. The mulches

showed at par results with the herbicide, that will encourage the farmers to reduce the reliability on chemical weed control.

ACKNOWLEDGEMENT

The authors appreciate the Higher Education Commission Pakistan for the grant of research project titled "Environment friendly weed management in vegetables" no. 20-2332/NRPU/R&D/HEC/13 which made this research get published.

REFERENCES CITED

Ahmad,K., Z.I. Khan, S. Yasmin, M. Ashraf and A.Ishfaq. 2014.Accumulation of metals and metalloids in turnip (Brassica rapa L.)irrigated with domestic wastewater in the peri-urban areas of Khushab city, Pakistan. Pak. J. Bot., 42(2): 511-514.

Bakht,T., I.A. Khan, K.B. Marwat and Z.Hussain. 2014. Integration of row spacing, mulching and herbicides on weed management in tomato. Pak. J. Bot., 46(2): 543-547.

Bostrom, U. and H. Fogelfors. 2002. Long-term effects of herbicide-application strategies on weeds and yield in spring-sown cereals. Weed Sci., 50:196-203.

Cadavid, L.F., M.A. EL – Sharkawy. and A. Aosta. 1998. Long – term effects of mulch, fertilization and tillage on cassava grown in sandy soils in northern Columbia. Field Crops Research 57, 45.

El-Batran, S.A.E.S., S.E. El-Gengaihi and O.A. El-Shabrawya, 2006. Some toxicological studies of *Momordicacharantia* L. on albino rats in normal and alloxan diabetic rats. J. Ethnopharmacol., 108: 236–242.

Government of Pakistan. 2010. Agricultural Statistics of Pakistan 2008-09. Ministry of Food and Agriculture (Economic Wing),Islamabad.pp;12,17-18

Jayakumar, R. and R. Jagannathan. 2007. Weed Science Principles, Second revised & enlarged edition, Kalyani publishers New Delhi, p. 117.

Joseph, J.K. 2005.Studies on the ecogeography and genetic diversity ofthe genus Momordica L. in India.PhD Thesis, University of Mahtma Gandhi Kottayam, Kerala, India, 315 p. Available online at http://www.mgutheses.in/page/?q=T%201079.

Noble, D. 2009. Working toward better cucurbits: Weed management strategies for the coming season. Available online at http://www.growingmagazine.com/article.php?id=2382 (verified 18 July, 2011).

Rao, V.S. 2000. Harmful effects caused by weeds. *Principles of Weed Science. Oxford and IBH publishing Co.* Pvt. Ltd. New Delhi & Calcutta, pp. 1-2.

Saeed, M.K., I. Shahzadi, I. Ahmad, R. Ahmad, K. Shahzad, M. Ashraf and Viqar-un-Nisa, 2010. Nutritional analysis and antioxidant activity of Bitter gourd (*Momordicacharantia*) from *Pakistan. Pharmacol*. 1: 252–260.

Sharma, R.R. and V.P. Sharma, 2003. Mulch influences fruit growth, albinism and fruit quality in strawberry (Fragaria x ananassa Duch.). Fruits 58, 221–227.

Singh, R.S., R.R.Sharma, and R.K.Goyal, 2007. Interacting effects of planting time and mulching on "Chandeler" strawberry (Fragaria x ananassa Duch.). Sci. Hortic. 111, 344– 351.

Sønsteby, A., A.Nes. and F. Måge, 2004. Effects of bark mulch and NPK fertilizer on yield, leaf nutrien status and soil mineral nitrogen during three years of strawberry production. Acta. Agric. Scand. Sect. B, Soil and Plant 54, 128 – 134.

Stall, W. M, 2009. Weed control in cucurbit crops (muskmelon, cucumber, squash, and watermelon [Online]. Available

at http://edis.ifas.ufl.edu/wg029 (verified 18 July, 2011).

Webster, T.M, 2006. Weed survey – Southern states. Vegetable, fruit and nut crops subsection. Proc. South.*Weed Sci. Soc*. 59: 260-277.

Treatments	**Weed density m^{-2}**		**No. of plants ha^{-1}**		**Fruit weight (g) plant^{-1}**	
	2012	**2013**	**2012**	**2013**	**2012**	**2013**
Hand weeding	68 d	83 d	9773.5 a	8077.3 a	756 a	657.39 a
Weedy check	2971 a	3595 a	5891.1 b	4868.7 b	257.5 e	223.91 e
Rumex crispus	1615 bc	1954 bc	8489.8 a	7016.4 a	396.5 de	344.78 de
Silybum marianum	1072 bcd	1297 bcd	8548.7 a	7065 a	435.5 cd	378.7 cd
News paper	1710 b	2069 b	7392.6 ab	6109.5 ab	390.55 de	339.61 de
Saw dust as mulch	816 bcd	988 bcd	8823.7 a	7292.3 a	567 bc	493.04 bc
Stomp 330 EC	495 cd	598 cd	8834 a	7301.1 a	667.5 ab	580.43 ab
$LSD_{0.01}$ (Treatments)	1138.5	1377.6	2556.4	2112.8	169.87	147.67
CV%	34.75	22.33	19.13	15.22	12.88	16.33
Year effect	1250 b	1512 a	8250 a	6818 b	495.75 a	431.11 b
$LSD_{0.01}$ (Years)	46.63		86.53		4.33	

Table 1. Weed biomass (kg ha^{-1})**,** No. of plants ha^{-1} and fruit weight (g) plant^{-1} as influenced by various treatments in bitter gourd crop at Peshawar Pakistan