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Effect Of Mulching On Growth And Yield Of Apple Underrainfed Conditions Of Hilly Region

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Abstract

Apple (*Malusdomestica*Borkh.)is the main crop grown in the rainfedhilly district of Doda, Union Territory of Jammu and Kashmir. The orchards are mainly established on medium to steep slopes, thus making the plants prone to water stress as well as nutrient loss from the soil. Under such conditions, mulching plays an important role to minimize moisture and nutrient loss but the farmers are not practising it. Considering the above factors, an onfarm trialwasconducted during the years 2016-17 and 2017-2018. The trial consisted of three treatments viz., T1-clean cultivation as control,T2- mulching with dry grasses, and T3-mulching with black polythene. The maximum annual growth (27.44 cm) was observed under black polythene mulch, while minimum was found under clean cultivation. The highest fruit yield(35.77kg/plant)was recorded in mulching with black polythene followed by mulching with dry grasses, however, lowest fruit yield (27.30 kg/plant) was observed under clean cultivation. Mulching with black polythene increased the yield by 31.74 percent as compared to control. It can be concluded that the plastic mulch has been found to be the best treatment for enhancing growth and yield of apple crop under rainfedhilly conditions.

Keywords; Apple, mulching, growth and yield

Introduction

Apple (*Malusdomestica*Borkh.) is the main crop grown under temperate horticulture in the hilly states of India. Jammu and Kashmir has remained the leading apple producer accounting for 67.7% of the total production in the country and production per hectare is 10.0 metric tons. It is successfully grown at an elevation range of 1600-2800 m above mean sea level (MSL) and needs chilling requirement of 1000-1600 hr at >7^{o}C (45^{o}F) to overcome the dormancy for bud development and flowering. The area and production of apple in Jammu and Kashmir is 164411 ha and 1882774 MT (National Horticulture Board, 2017-18). The area under apple in Doda district as reported in the year 2017-18 is 5954 ha (National Horticulture Board,2017-18) but the production and quality is very low as compared to other districts of Jammu and Kashmir.Among various factors responsible for higher yield, supply of nutrients and availability of moisture play a vital role in the production ofquality apple fruits. Mulching is one of the most important aspectto reduce loss of water in rainfed areas.There are several benefits of using mulch, including soil temperature modulation, enhanced fruit quality, improved soil and water management by reducedevaporation and soil erosion, reduced fertilizer leaching and suppression of weed growth which leads to better plant growth and yield. Further it was reported that the mulching booststhe yield by 50-60 percent over no mulching under rainfed conditions (Dilip*et al.,* 1990).Different mulching materials have been used for different horticultural species in different climatic environments and the results vary according to the chosen approach, growing practices, conditions and species, so generalisation is hard to make. Considering the above factors, the present onfarm trial was undertaken to know the effect of mulching on growth and yield of apple in the hilly terrain of district Doda.

Materials and methods

The present trial was carried out at farmer's orchard during the year 2016-17and 2017-18. The 8 to 9 year old trees of apple cv. Red Delicious were selected for the study. The trial consisted of three treatments viz.,T1- clean cultivation (control), T2-mulching with dry grasses (15 cm thick) and T3-mulching with black polythene (100 gauge). The experiment

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was laid out in randomized block design with four replications. The growth was measured as annual extension growth of shoot and yield attributes were obtainedin terms of yield (kg/ plant) atthe time of fruit harvesting. The yield (q/ha) was calculated on the basis of plants in a plantation planted at 7x7 m distance. The economic analysis was also calculated in terms of cost of cultivation, gross return, net return and benefit cost ratio. Thetwo years pooled data was analyzed according to the procedure of analysis for Randomized Block Design and critical differenceat 5 per cent probability was calculated to compare the mean values of treatments for all the characters.

Results and discussion

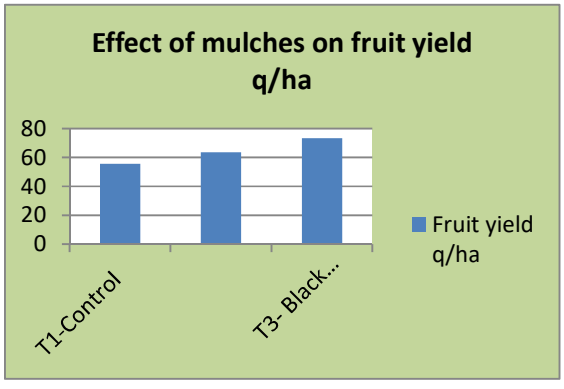
The pooled data in Table 1 indicate that the mulching significantly affected the growth of the plants. The annual growth of the plant was found highest (27.44 cm) in treatment T3 (mulching with black polythene) while treatment T1 (clean cultivation) showed the lowestannual growth during both the years of experiment.

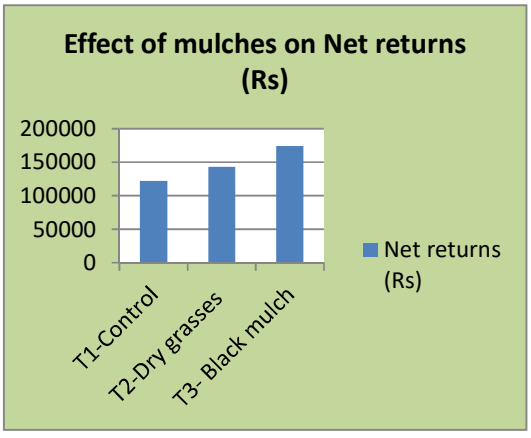
Table 1: Effect of various mulches on growth and yield of apple cv. Red Delicious

Treatment	Annual extension growth (cm)	Yield (kg/plant)	Yield* (q/ha)	Yield Increase %
T1- clean cultivation as control	18.98	27.30	55.69	---
T2- mulching with Dry grasses	24.93	31.10	63.44	15.65
T3- mulching with Black polythene	27.44	35.97	73.37	31.74
CD at 5%	1.11	1.66	0.83	
SE(m)	0.31	0.47	0.23	
CV (%)	2.65	2.99	0.73	

*Plant spacing 7x7m

The availability of soil moisture and nutrient with less weed growth associated with mulch material can be attributed to maximum annual growth of the plant. Regarding fruit yield data (Table 1) revealed that the highest fruit yield (35.97 kg/plant) was obtained with treatment T3 i.e. black polythene mulch followed by treatment T2 dry grasses (31.10 kg/plant). However, the lowest fruit yield (27.30 kg/plant) was found with control treatment T3 (clean cultivation) during both the years of experimentation. Consequently the highest fruit yield (73.37 q/ha) was obtained with black polythene mulch while the minimum yield (55.69 q/ha) was found under clean cultivation in the apple orchard.The maximum fruit set and highest fruit yield under black polythene mulch followed by dry grasses may probably be due to the increase in soil moisture, higher nutrient availability and lesser weed infestation, however in clean cultivation less soil moisture retention and nutrient losses resulted in low fruit set. Similar findings were reported by Das *et al.*(2010)and Pratima*et al.*(2015)with black mulch in guava and kiwi respectively. Bond and Grundy, 2001 also reported prevention of emerging weeds with use of black mulch.





Economic Analysis

Table 2 ; Economic analysis on use of various mulches on apple cv. Red Delicious

Treatment	Cost of cultivation (Rs)	Gross returns (Rs)	Net returns (Rs)	B:C Ratio
T1- clean cultivation as control	72550	194915	122365	2.68:1
T2- mulching withDry grasses	78550	222040	143490	2.82:1
T3- mulching with Black polythene	82550	256795	174245	3.11:1

The data pertaining toeconomic analysis is tabulated in table no 2. The maximum gross return (Rs 256795 lakh/ha/year) and net return (Rs 174245 lakh/ha/year) were recorded with treatment T3 i.e. mulching with black polythene and the minimum gross return (Rs.194915lakh/ha/year)and net return (Rs 122365 lakh/ha/year) were obtained with treatment T1 (Clean cultivationas control). The maximum benefit cost ratio (3.11:1) was obtained with black polythene mulch (T3) followed by mulching with dry grasses (T2). However, minimum benefit cost ratio (2.68:1) was found with the treatment T1 (Clean cultivation). The highest economic returns with polythene mulch were due to highest fruit yield which fetches highermarket prices. Nautiyal*et al*.(2015) also reportedthat the maximum net return was obtained withpolythene mulch in apple fruit.

Conclusion

On the basis of this onfarmtrial, it can be concluded that the black polythenemulching is an excellent horticultural technique that is beneficial in improving growth, quality and productivity of apple crop. Therefore mulching can be adopted by the farmers of rainfedhilly regions to fetch more returns.

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