Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; SP1: 244-246

Rupinder Kaur
M.Sc. Student, Department of Agriculture, Mata Gujri College, Shri Fatehgarh Sahib, Punjab, India

Santosh Kumar
Assistant Professor, Department of Agriculture Agronomy, Mata Gujri College, Shri Fatehgarh Sahib, Punjab, India

Harpreet Kaur
Assistant Professor, Department of Agriculture Agronomy, Mata Gujri College, Shri Fatehgarh Sahib, Punjab, India

Correspondence
Rupinder Kaur
M.Sc. Student, Department of Agriculture, Mata Gujri College, Shri Fatehgarh Sahib, Punjab, India

(Special Issue- 1)
2nd International Conference
"Food Security, Nutrition and Sustainable Agriculture - Emerging Technologies"
(February 14-16, 2019)

Effect of irrigation and Mulche on barley (*Hordeum vulgare* L.) in central Punjab

Rupinder Kaur, Santosh Kumar and Harpreet Kaur

Abstract
An experiment was conducted during *Rabi* season of 2017 at Experimental Farm of Department of Agriculture, Mata Gujri College, Shri Fatehgarh Sahib, Punjab to study the effect of irrigation and mulching on barley (*Hordeum vulgare* L.) in Central Punjab. The experiment was laid out in randomized block design with eight treatments *viz.* T_2 - mulch (paddy straw @ 4 t/ha) + irrigation at CRI stage, T_3 - irrigation at CRI stage, T_4 -mulch (paddy straw @ 6 t/ha) + irrigation at CRI stage, T_5 - Two irrigation at CRI and tillering T_6 - mulch (paddy straw @ 6 t/ha) + irrigation at CRI and flowering, T_7 - mulch (paddy straw @ 4 t/ha) + irrigation at CRI and flowering, T_8 - irrigation at CRI, MT & heading stage were compared with T_1- control treatment. The treatments were replicated thrice. On the basis of result summarized the maximum growth parameters *viz.* Plant height (cm), number of tillers in running meter, leaf area index and dry matter accumulation (g/m) were maximum with the application of T_6 - mulch (paddy straw @ 6 t/ha) of Rs. 87784.66 ha and maximum benefit: cost ratio is 1.15.

Keywords: LAI, mulches, yield attributes

Introduction
Barley (Hordeum vulgare) is one of the cereals which tolerate rather well abiotic stress conditions. Growers driven by the market demands tend to cultivate wheat even in areas which are more suited for barley; such areas can, however, easily be brought again under barley. Although the area under barley and wheat can be interchanged, on an overall basis, the area under barley cultivation is governed by a wide range of other factors like demand from consumers or market price.

Water is one of the most important factors that are necessary for proper growth, balanced development and higher yield of all crops. Water deficiency affects plant growth and grain yield (Hussain *et al*. 2004) [1]. Irrigation management is one of the important managerial activities and effects the effective utilization of water by crop. Maximum grain yield (2.27 t/ha) was obtained with application of 200 mm irrigation treatment (Shirazi *et al*. 2014) [8]. Under scarcity of water, four irrigation schedules at crown root initiation, tillering, flowering and milking stages recorded higher grain yield resulting in saving two irrigation for wheat (Kumar *et al*. 2015) [3]. Irrigation at jointing and anthesis improved grain yield by an average of 12.70 and 18.65% as compared with no irrigation in wheat (Zhang *et al*. 2017) [10].

Mulch is one of the important agronomic practices for conserving soil moisture and modifies soil health. Mulch works as a protective layer for soil that stimulates root growth and suppresses the weed growth. Mulching significantly increased yield, water use efficiency, nitrogen use efficiency up to 60% compared with no mulch (Qin *et al*. 2015) [5]. Wheat straw mulch reduces evaporation by 50 % under wheat and saved about 80 mm water during wheat growth season (Singh *et al*. 2016) [9].

Mulch is help in soil moisture conservation, check the weed growth and also add organic carbon. The growth and development of barley crop in which mulch is done in higher as compare to the simple crop. It is economically beneficial for the farmers by reducing the germination of weed and conserving the moisture of soil. Straw mulch significantly increased total weed population compared with the treatment without mulch. Micro climate around a

plant is directly affected by mulches as it modifies the radiation budget of the surface and decreases the soil water loss (Liakates *et al.* 1986).

Materials and Methods

A field experiment was conducted at Experimental Farm of Department of Agriculture, Mata Gujri college, Shri Fatehgarh sahib, Punjab during *Rabi* season of 2016-2017. The experiment laid out in randomized block design with three replicated. The treatment details are as T_1 - control, T_2 - mulch (paddy @4 t/ha) + irrigation at CRI stage, T_3 - irrigation at CRI stage, T_4 - mulch (paddy straw @ 2 t/ha) + irrigation at CRI stage, T_5 -irrigation at CRI and tillering, T_6 - mulch ((paddy @ 6 t/ha) + irrigation (at CRI & flowering stage), T_8 - irrigation at CRI, MT & heading stage. The soil of experiment field gangetic alluvial having clay loam texture with pH (7.6), medium in organic carbon (0.47 %), electrical conductivity (0.56 dS/m at 25 °C), available P_2O_5 (14.46 kg/ha), K_2O (171.15 kg/ha) and N (280.20 kg/ha). The pre-treated seed variety PL 807 were sown by hand drilling in between the rows by using wheat seed at the rate of 70 kg/ha with a spacing of 22.5 cm on 22th November, 2016. The recommended dose of fertilizers of NPK for wheat is 120, 60, 40 kg/ha. Applied 1/3 dose of nitrogen and full dose P_2O_5 and K_2O as basal and remaining dose of nitrogen was applied in two split at 30 DAS and 60 DAS. Irrigation was given as per treatments. Mulching was applied on week after emergence of crop. Mulch paddy straw (6 t/ha), mulch Paddy straw (5 t/ha) and irrigation were applied according to the treatments. The major agronomical done as per requirement. Regular biometric observations were recorded at periodic intervals of 30 DAS, 60 DAS, 90 DAS and at harvest stage of four selected plant. Yield attributes parameters were recorded just before harvesting of crop. The crop was harvested on 20th April 2017 when the straw and spike colour turns into yellow and grains are fully ripened and then tied into the labelled bundles. The sun dried weight of bundles was recorded. The threshing of crop was done with the help of tractor drawn thresher. Thus grain yield of each plot was recorded. Statistical data were analysed by standard procedure by Gomez & Gomez, 1984) [6].

Effect of irrigation and mulch on yield attributes

The yield attributes characters *viz.* no. of effective tillers, no. of grains spike^{-1}, spike length, test weight were significantly influenced by irrigation scheduling and mulching treatments as compared to control treatment. Application of T_6 - mulch (paddy straw @ 6 t/ha) + irrigation at CRI and flowering recorded higher yield attributes and were at par of treatment T_8 - irrigation at CRI, MT and heading. Thus, the result indicated that increase in yield contributing characters of plots treated with application of T_6 - mulch (paddy straw @ 6 t/ha) + irrigation at CRI and flowering was due to levels of irrigation with mulching increases the soil moisture and nutrient availability to plant roots in turn, leading to higher grain yield. Similar results were reported by Sarwar *et al*. (2013) and Singh *et al*. (2017).

Effect of irrigation and mulch on yield

Yield is the result of co-ordinate interplay of various growth characters. Grain (q/ha) and straw yield (q/ha) were significantly influenced by different treatments. Application of T_6 - mulch (paddy straw @ 6 t/ha) + irrigation at CRI and flowering was recorded higher grain yield followed by T_8 - irrigation at CRI, MT and heading and T_7 - mulch (paddy straw @ 4 t/ha) + irrigation at CRI and flowering. However in case of maximum straw yield was recorded under application of T_6 - mulch (paddy straw @ 6 t/ha) + irrigation at CRI and flowering followed by T_8 - irrigation at CRI and flowering and T_7 - mulch (paddy straw @ 4 t/ha) + irrigation at CRI and flowering. Tolk *et al*. (1999) observed that mulches applied on soil increased grain yield in maize significantly as compare with bare soil. Mulch significantly increased grain yield in maize. Maximum grain yield was observed in M_2 (Mulch @ 14 Mg ha^{-1}) (10.5 Mg ha^{-1}), followed by M_1 (Mulch @ 7 Mg ha^{-1}) (9.4 Mg ha^{-1}) and minimum in M_0 (Mulch @ 0 Mg ha^{-1}) (8.6 Mg ha^{-1}). Tolk *et al*., (1999) and Liu *et al*., (2002) concluded that mulch increases soil moisture and nutrients availability to plant roots, in turn, leading to higher grain yield. Reported significantly maximum grain yield in maize 5.77 Mg ha^{-1} was observed in treatment where mulch was applied @ 8 Mg ha^{-1} followed by 5.70 Mg ha^{-1} in treatment where mulch was applied @ 12 Mg ha^{-1} and 5.38 Mg ha^{-1} in treatment, where mulch was applied @ 4 Mg ha^{-1} with mean minimum value 4.92 Mg ha^{-1} was observed in case of control. There was significant difference in grain yield when mulch was applied @ 12, 8 and 4 Mg ha^{-1} as compared with control (Khurshid *et al*., 2006) [2].

Table 1: Effect of irrigation and mulch management on crop yield (q/ha) and harvest index (%)

Treatments	Grain yield (q/ha)	Straw yield (q/ha)	Biological yield (q/ha)	Harvest index (%)
T_1- Control	29.00	36.70	64.93	29.00
T_2- Mulch (paddy straw @ 4 t/ha) + irrigation at CRI	40.33	64.48	104.94	40.33
T_3- Irrigation at CRI	41.66	52.19	89.31	40.67
T_4- Mulching (paddy straw @ 6 t/ha) + irrigation at CRI	41.33	67.64	123.59	41.33
T_5- Two irrigation at CRI and tillering	38.67	59.79	107.70	38.67
T_6- Mulch (paddy straw @ 6 t/ha) + irrigation at CRI and flowering	45.33	85.32	130.46	45.33
T_7- Mulch (paddy straw @ 4 t/ha) + irrigation at CRI and flowering	44.67	76.80	121.97	44.67
T_8- Irrigation at CRI, maximum tillering and heading	43.33	77.62	120.95	43.00
S.Em±	2.01	2.15	4.89	3.12
C.D. at 5 %	6.09	7.23	14.84	9.46

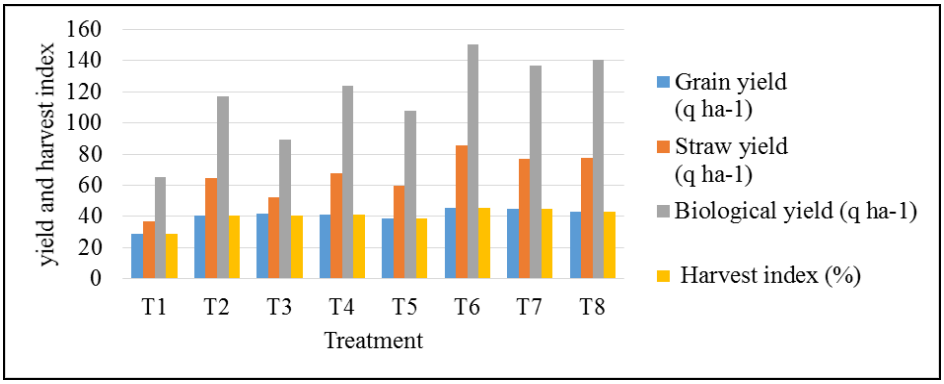

Fig 1: Effect of irrigation and mulch management on crop yield (q/ha) and harvest index (%)

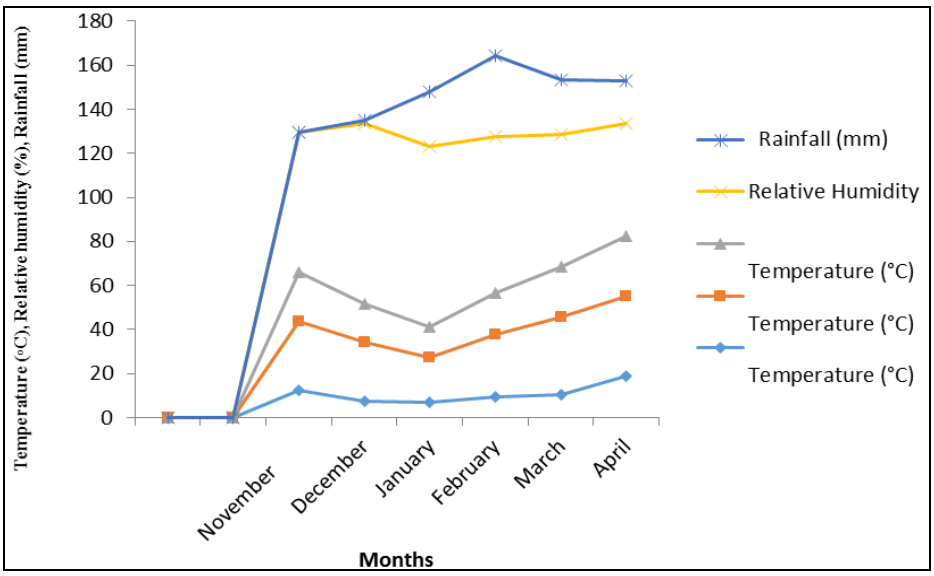

Fig 2: Meteorological conditions during barley crop growing seasons (2016 – 2017)

- Mean temperature
- Maximum temperature
- Minimum temperature

Table 2: Meteorological conditions during barley crop growing seasons (2016-17)

Months	Temperature (°C)			Relative Humidity (%)	Rainfall (mm)
	Minimum	Maximum	Mean		
November	12.6	31.3	21.9	64	0
December	7.4	26.9	17.1	82	1.7
January	7.1	20.3	13.7	82	24.6
February	9.2	28.5	18.8	71	36.6
March	10.3	35.3	22.8	60	24.9
April	19	36	27.5	51	19.4

***Source*:** KVK, Fatehgarh Sahib, Punjab – 14040

References

1. Hussain A, Ghaudhry MR, Wajad A, Ahmed A, Rafiq M, Ibrahim M *et al*. Influence of water stress on growth, yield and radiation use efficiency of various wheat cultivars. International Journal of Agricultural Biology. 2004; 6:1074-1.
2. Khurshid K, Iqbal M, Arif MS, Nawaz A. Effect of tillage and mulch on soil physical properties and growth of maize. International Journal of Agriculture & Biology. 2006; 8:593-596.
3. Kumar R, Ahmed A. Effect of irrigation scheduling on growth and yield of wheat genotype. Journal of Agronomy. 2015; 35(3):199-202.
4. Liakatas A, Clark JA, Monteith JL. Measurements of the heat balance under plastic mulches. Part I. Radiation balance and soil heat flux. Agriculture and Forest Meteorology. 1986; 36:227-239.
5. Qin W, Chunsheng H, Oenema O. Soil mulching significantly enhances yields and water and nitrogen use efficiencies of maize and wheat a meta analysis. Journal of Scientific Report. 2015; 5:10-38.
6. Gomez KA, Gomez AA. Statistical procedures for agricultural research 2nd edition. John Willey and Sons, New York. 1984, 680.
7. Ramakrishna A, Tam HM, Wani SP, Long TD. Effect of mulch on soil temperature, moisture, weeds infestation and yield of groundnut in northern Vietnam. Field Crops Research. 2006; 95:115-125.
8. Shirazi M, Dixit CK, Sahai A. Effect of irrigation scheduling on growth, yield and quality of wheat in sodic soil. Journal of Agricultural Sciences. 2014; 22(3):162-169.
9. Singh B, Humphreys E, Gordon DS, Eberach PL. Evaluation of effect of mulch on optimum sowing date and irrigation management of zero till wheat in Central Punjab, India using APSIM. Journal of Field Crops Research. 2016; 197:83-96.
10. Zhang P, Geng M, Wang C, Hongfang L, Shasha L, Yingxin X *et al*. Effect of irrigation and nitrogen application on grain amino acid composition and protein quality in winter wheat. Journal of Agronomy. 2017; 12(6):152-159.