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EFFECT OF LAST CUTTING DATES ON SEED PRODUCTION OF MULTICUT MB-87 – A VARIETY OF PEARL MILLET, *PENNISETUM GLAUCUM* (BAJRA)

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ABSTRACT. Pearl millet (*Pennisetum glaucum*) is considered an important kharif crop, which is grown extensively in the arid and semi-arid tropical regions, where other crops, like sorghum and maize, fail to produce economic yields. Its grains are valued as human food, while its dry stover makes significant livestock ration in crop-livestock farming system. Pearl millets (MB-87), a newly developed variety of Fodder Research Institute, Sargodha, Pakistan, is one of the best pearl millet variety, which gives more than one cutting and helps to cope with fodder lean period, as well as more income can be generated in addition to seed. So, overcome the scarcity period the study was conducted to check the effect of last cutting dates on seed production of multicut pearl millet MB-87 was conducted at Fodder Research Institute, Sargodha, Pakistan, during 2015 and 2016. Following parameters were taken in to consideration, *i.e.* plant height (cm), stem thickness (cm), number of leaves per tiller, number of tillers per plant, green fodder yield (t/ha), length of head (cm), 1000 grains weight (g) and grain yield (kg/ha). The results depicted that grain yield, *i.e.* 319.20, was maximum and head length was highest, *i.e.* 35.13 cm on 20th of August having last date of cut, whereas all others parameters were found to be non-significant. Multicut bajra gives three cutting of fodder, followed by seed, as compared with conventional bajra, which gives only one cutting or seed. Therefore, it is more economical for the growers of fodders to grow the pearl millets MB-87 as fodder, as well as for seed purposes. So, it is concluded that for gaining maximum grain yield of multicut pearl millet MB-87 the last cutting date should be 20th of August. In future, pearl millet is likely to play a larger role in providing food and nutritional security.

Key words: pearl millets; MB-87; grain yield; fodder yield; production; Punjab-Pakistan.

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INTRODUCTION

Livestock is one of the main subsectors of agriculture in Pakistan and plays key role in the economy of the country. It contributed approximately 56.3% of the agricultural value addition and11.8% to the national gross domestic production during 2014-2015 (Govt. of Pakistan, 2015). Fodders are the best source of nutrition for animals. Area under fodder crops is about 2.35 Mha in Pakistan, which is 12% of the total cultivated area of Pakistan (Govt. of Pakistan, 2013). In Punjab, fodder crops are sown on an area of 2.7 Mha, with forage production of 57 Mt, providing an average forage yield of 21.1 t/ha (Bhatti, 2001; Bilal *et al*., 2001). Due to less yield per hectare and minimum area under fodder crops, the available fodder production is one third less than required and shortage is increasing due to reduction in area under fodder crops by 2% after each decade (Sarwar *et al*., 2002).

Pearl millet (*Pennisetum glaucum*) is an important fodder crop of summer season. It is a dual purpose crop grown throughout the country both for seed and fodder use. It is well adapted to growing areas characterized by drought, low soil fertility and high temperature. It performs well in soils with high salinity or low pH. It can be grown well in areas where other crops, like maize or wheat, would not survive (https://en.wikipedia.org/wiki/Pearl_millet). Pearl millet is drought resistant than other kharif fodders. It is also called crop of barani areas, useful for milching and other animals. Grain of pearl millet is specially used for nutrition of hens. Pearl millet is a summer annual crop well-suited for double cropping, rotations having many cuttings. Its green fodder contains 1.50% protein, 0.33% fat and 6.89% crude fibre. Mixed cropping of pearl millet with maize and sorghum is very popular (Chaudhry, 1979) used as a fodder.

Ferraris (1973) found that, as a forage crop, pearl millet was equivalent to tropical forage grasses in weight gains and milk production. High dry matter yields and good quality silage have been produced from pearl millet (Andrade & Andrade, 1985), while Al Hassan & Nwasike (1987) reported that high dry matter yields can be obtained at seed set stage. Pearl millet is the best alternative of scarcity period. Among choices to control the scarcity, the most important are cultivation of high yielding crop varieties (Bilal *et al.,* 2001) and efficient resource use crop production through better agronomic management practices. Many studies have evidenced that cultivars played major role in forage yield. Significant differences have been reported among the pearl millet cultivars for yield and quality traits (Ashraf & Harris, 2004). Modern trend of worldwide agriculture is to explore prolific, environment friendly and sustainable cropping pattern by adopting integrated methods of management, including nutrition arrangement of crop, proper sowing method and

selecting appropriate stage of harvesting (Crew & Peoples, 2004). Time of harvesting is a major factor affecting the yield of crop. There are studies that proved the effects of harvesting interval not only on yield but quality of forage produce, which is, ultimately, an important aspect of forage production. Ram & Singh (2007) reported that harvesting interval effects the chemical composition of forages and according to Joshi *et al.* (2004) yield mostly increases as harvesting time is extended, but quality is reduced. Selection of proper harvesting interval and usage of efficient planting pattern improve the total mixed green forage yield, as well as crude protein (Iqbal *et al*., 2006).

In Pakistan, information regarding appropriate harvesting date for seed production of pearl millet (multicut bajra) is deficient, so the present study was conducted to know the effect of last cutting dates on seed production of pearl millet grain yield of multicut bajra, MB-87.

MATERIAL AND METHODS

The study was conducted at Fodder Research Institute, Sargodha-Punjab, Pakistan. Four different last cutting dates, *i.e.* 5th July, 20th July, 5th August and 20th August, respectively, were taken in to consideration.

Field preparation and sowing

The land was prepared by ploughing two times, then use of rotavator, followed by planking. Plot size was 2.7 × 6 m. Sowing was done with help of a hand pulled drill with rows having distance 45 cm. The seed rate was kept 10 kg/ha. There were four replications under RCBD. Following parameters were taken in to consideration, *i.e.* plant height (cm), stem thickness (cm), number of leaves per tiller, number of tillers per plant, green fodder yield (t/ha), length of head (cm), 1000 grains weight (g) and grain yield (kg/ha).

Plant height

The data regarding plant height was recorded in cm with the help of measuring rod by taking five plants per plot, then average was calculated.

Stem thickness

The data regarding stem thickness was recorded in mm with the help of venire caliper by taking five plants per plot and then average was calculated.

Number of leaves

The data regarding number of leaves was recorded by taking five plants per plot. After taking data average was calculated.

Number of tillers/plant

The data regarding number of tillers/plant was counted by taking five plants per plot and then average was calculated.

Green fodder yield (t/ha)

The data regarding green fodder yield was recorded in tones/ hectare with help of weighing balance.

Length of head (cm)

The data regarding length of head was recorded in cm by taking five plants with the help of measuring rod.

1000 grains weight

The data regarding 1000 grains weight was recorded in grams with the help of weighing balance and then average was calculated.

Grain yield (kg/ha)

The data regarding grain yield was recorded in kg/ha with the help of weighing balance and then average was calculated.

Statistical analysis

The data was compiled and analyzed using Statistix version 8.1 and means were separated by least significant difference.

RESULTS

The data in the *Table 1* shows that there is no significant difference regarding plant height (cm), stem thickness (mm), number of leaves/tiller, green fodder yield (t/ha), number of tiller's/plant, leaf area cm^2 in three treatments, *i.e.* T1, T2 and T3 and T4, but head length (cm) and grain yield (kg/ha) in fourth treatment (20^{th} August, last date of cut) is maximum, which are 36.75 cm and 319.50 kg/ha, respectively. While minimum head length (cm) was in T3 (5^{th} August, date of last cut), which is 24.50 cm, and grain yield was minimum in T1 (5^{th} July, date of last cut), *i.e.*194.50 kg/ha, during 2015.

Table 1 - Data regarding different parameters of multicut bajra, during 2015

Treatments	Parameters								
	Plant height (cm) NS	Stem thickness (mm) NS	No of leaves/tiller NS	Green fodder yield (t/ha)	Grain yield (kg/ha)	No of tillers /plant NS	Head length (cm)	Leaf area (cm^2)	1000 grains weight (g) NS
T1= 5^{th} July	105.50 a	0.85 a	9.00 a	13.10 a	194.50 d	17.00 a	31.83 b	137.70 a	5.00
T2= 20^{th} July	105.00 a	0.93 a	9.00 a	15.83 a	222.25 c	18.00 a	26.75 c	134.02 a	5.00
T3= 5^{th} August	104.75 a	1.00 a	8.00 a	15.97 a	236.00 b	17.00 a	24.50 c	138.93 a	5.00
T4= 20^{th} August	106.50 a	1.00 a	8.00 a	14.80 a	319.50 a	16.00 a	36.75 a	142.35 a	5.00
LSD value @ 5%	-	-	-	-	4.46	-	4.64	-	-

Means sharing similar letters are not significantly different by LSD at $P< 0.05$; LSD = least significant difference

Table 2 shows that there is no significant difference in plant height (cm), stem thickness (mm), number of leaves/tiller, green fodder yield (t/ha), number of tillers/plant and leaf area (cm^2), but head length (cm) and grain yield (kg/ha) in T4 (20^{th} August, date of last cut) is maximum, which is 33.50 cm and 319.50 kg/ha, respectively, while minimum head length was in T3 (5^{th} August, date of last cut), which was 24.50 cm and minimum grain yield was in T1 (5^{th} July, date of last cut), which was 194.50 kg/ha, during 2016.

Table 2 - Data regarding different parameters of multicut bajra, during 2016

Treatments	Parameters								
	Plant height (cm) NS	Stem thickness (mm) NS	No. of leaves/tiller NS	Green fodder yield (t/ha)	Grain yield (kg/ha)	No. of tillers /plant NS	Head length (cm)	Leaf area (cm^2)	1000 grains weight (g) NS
T1= 5^{th} July	148.25 a	0.400 a	8.00 a	37.77 a	194.50 d	16.00 a	25.50 b	126.00 a	5.00
T2= 20^{th} July	153.00 a	0.400 a	8.00 a	39.16 a	222.25 c	18.00 a	26.75 b	137.68 a	5.00
T3= 5^{th} August	154.00 a	0.350 a	9.00 a	36.11 a	236.00 b	18.25 a	24.50 b	127.10 a	5.00
T4= 20^{th} August	154.00 a	0.400 a	9.00 a	38.88 a	319.50 a	16.00 a	33.50 a	132.15 a	5.00
LSD value @ 5%	-	-	-	-	4.57	-	2.26	-	-

Means sharing similar letters are not significantly different by LSD at $P < 0.05$ LSD = Least Significant Difference

The data in *Table 3* shows that on an average of two years that there is no significant difference regarding plant height (cm), stem thickness (mm), number of leave/tiller, green fodder yield (t/ha), number of tillers/plant and leaf area (cm^2). Head length (cm) is maximum in T4, *i.e.* 20^{th} August (date of last cut), which is 35.13 cm and minimum head length was in T3, *i.e.* 5^{th} August (date of last cut), which was 24.50 cm. Grain yield was maximum in T4, *i.e.* 20^{th} August (date of last cut), which was 319.50 kg/ha and minimum grain yield was in T1, *i.e.* 5^{th} July (date of last cut), which was 194.50 kg/ha.

Table 3 - Data regarding different parameters of multicut bajra, during 2015 and 2016

Treatments	Parameters								
	Plant height (cm) NS	Stem thickness (mm) NS	No. of leaves/tiller NS	Green fodder yield (t/ha)	Grain yield (kg/ha)	No. of tillers /plant NS	Head length (cm)	Leaf area (cm^2)	1000 grains weight (g) NS
T1=5th July	126.88 a	0.63 a	8.50 a	25.59 a	194.50 d	16.50 a	28.67 b	131.85 a	5.00
T2=20th July	130.00 a	0.66 a	8.50 a	27.50 a	222.25 c	18.00 a	26.75 bc	131.85 a	5.00
T3=5th August	129.38 a	0.67 a	8.50 a	26.04 a	236.00 b	17.63 a	24.50 c	133.01 a	5.00
T4=20th August	126.00 a	0.70 a	9.50 a	24.37 a	319.50 a	16.00 a	35.13 a	137.25 a	5.00
LSD value @ 5%	-	-	-	-	3.77	-	3.22	-	-

Means sharing similar letters are not significantly different by LSD at $P< 0.05$ LSD = Least Significant Difference

DISCUSSION

Production of fodder seed is an important aspect of fodder for utilization of livestock. But, there are some factors, which effect on seed production, like last cutting dates, planting dates, availibity of pollinators and management of insect pests. But, the time of last cutting dates and cutting frequency are also very important agronomic practices for multicut forage crops. So, the present studies were conducted to know the factors responsible for high seed production. Our results suggested that if last cut date was 20th of August then maximum grain yield and head length can be obtained. Further, this increase in grain production and head length may be due to more accumulation of nutrients and essential elements from soil. Our results are not in conformity to that of Yadav *et al*. (2015), who reported that in berseem crop seed yield increased with increased date of last cut. Similarly, Karar *et al*. (2017) (unpublished data) concluded that delayed in last cut of lucerne and berseem resulted in reduction of seed production.

CONCLUSION

It is concluded that if pearl millet variety MB-87 is sown in first week of March, three cuttings of fodder can be taken and then crop can be left for seed production. If crop is sown after second week of March, then two cuttings of fodder can be taken and crop can be left for seed production. If crop is sown after fourth week of March, then only one cutting of

fodder can be taken and crop can be left for seed production.

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