Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(2): 1339-1342
Received: 27-01-2018
Accepted: 28-02-2018

Waheddullah
M. Sc. Scholar, Department of Agronomy, CCS Haryana Agricultural University, Hisar, Haryana, India

Anil Kumar Dhaka
Assistant Professor, Department of Agronomy, CCS Haryana Agricultural University, Hisar, Haryana, India

Satish Kumar
Professor, Department of Agronomy, CCS Haryana Agricultural University, Hisar, Haryana, India

Jitender K Bhatia
Assistant Scientist, Department of Agronomy, CCS Haryana Agricultural University, Hisar, Haryana, India

Bhagat Singh
Assistant Scientist, Department of Agronomy, CCS Haryana Agricultural University, Hisar, Haryana, India

Ramprakash
Assistant Scientist, Department of Agronomy, CCS Haryana Agricultural University, Hisar, Haryana, India

Correspondence
Anil Kumar Dhaka
Assistant Professor, Department of Agronomy, CCS Haryana Agricultural University, Hisar, Haryana, India

Qualitative and Economical performance of dual purpose wheat as influenced by sowing time and cutting schedule

Waheddullah, Anil Kumar Dhaka, Satish Kumar, Jitender K Bhatia, Bhagat Singh and Ramprakash

Abstract
Field experiment was conducted during *rabi* 2016-17 at Research farm of CCS Haryana Agricultural University, Hisar, India to study the influence of sowing times and cutting schedules on quality and economics of dual purpose wheat. The experiment was laid out in split plot with four sowing times as main plot treatments and five cutting schedules as sub plot treatments, replicated thrice. Among sowing times, 3rd week of October recorded significantly higher quality and yield parameters with net returns (81503 Rs./ha) and B:C (2.10). Among cutting schedules, higher reduction rate in all quality, economics and yield parameters over uncut wheat was recorded with delay in cutting of wheat for fodder purpose from 45 to 75 DAS. Among cutting schedules, cutting of wheat at 45 DAS was recorded with maximum value of all quality parameters and yield, while cutting at 55 DAS was found most profitable.

Keywords: sowing time, cutting schedule, quality, economics, dual purpose wheat

Introduction
The importance of livestock in Indian agriculture is well recognized. At present, India faces a net deficit of 35.6% green fodder, 10.9% dry crop residues and 44% feed (IGFRI, 2013). Wheat (*Triticum aestivum* L.) being world first ranked grain crop is the basis of the agricultural economy which in terms of cultivated area (223.813 m ha), production (733.1 m t) and with productivity of (3280 kg ha^{-1}). India is the second largest producer of wheat next to China in the world. The area, production and productivity of wheat in India is 30.7 m ha, 97.4 m t and 3172 kg ha^{-1}, respectively and The area, production and productivity of wheat in Haryana state is 2.54 m ha, 11.4 m t and 4407 kg ha^{-1}, respectively (AICRP on Wheat and Barley, Director's Report 2016-17). India constitutes about 12.5% of wheat global production. The ever-rising demand for fodder and feed for sustaining livestock production can be met through increasing productivity of fodder and utilizing untapped feed resources. Cereals are grown predominantly as grain crops in most of the sub tropical countries of the world and their use for dual purpose. In India, wheat is one of the major cereal crops cultivated for grain production for human consumption. To mitigate the continued shortage of green fodder for animal consumption conventional cereal crops need to be grown for dual purpose for fodder and grain under irrigated farming system (Dunphy *et al*., 1982; Naveed, 2013; Dove and Kirkegaard, 2014; Jarial, 2014) [4, 11, 3, 8]. In some countries like Australia, Pakistan, USA, etc. wheat is commonly grown for the dual-purpose of producing forage and grain from the same crop, but in India, this kind of experience is still unexploited. Wheat is a valuable source of high quality forage, rich in protein, energy, nutrients and low in fibre (Hossain *et al*., 2003) [6]. Planting time is one of the utmost important management factors affecting both fodder production and grain yield in wheat crops. Early and normal sowing has longer growth duration which consequently provides an opportunity to accumulate more biomass as compared to late sowing and henceforth manifested in higher grain and biological yield (Kumar and Kumar, 2014) [9]. On the other hand, Cutting may reduce grain yield in wheat, due to leaf area limitations and tiller senescence during reproduction phase if crop is not managed properly. The normal vegetative growth is required after cutting to produce reasonable yield, so schedule of cutting as well as sowing time both are important to realize the optimum yield of green fodder and grains from dual purpose wheat. But little information on this aspect is available in respect to tall wheat (C306). Keeping these points in view, the present investigation was conducted to study quality and economics of dual purpose wheat under different sowing times and cutting schedules.

Materials and Methods

The experiment was conducted at Agronomy Research Area of CCS Haryana Agricultural University, Hisar, which is situated in the sub-tropical region at 29° 10' N latitude and 75° 46' E longitude with an elevation of 215.2 meter above mean sea level in Haryana state of India, during *Rabi* season of 2016-17. The experiment was comprised of four sowing times (3rd week of October, 4th week of October, 1st week of November and 2nd week of November) as main plot treatments and five cutting schedules (Uncut, cutting at 45 DAS, cutting at 55 DAS, cutting at 65 DAS and cutting at 75 DAS) as sub plot treatments. Experiment was laid out in split plot design with three replications. The soil of experiment sites in general was sandy loam. The nitrogen, phosphorus and potassium of soil were 133 kg ha^{-1}, 18 kg ha^{-1} and 245 kg ha^{-1}, respectively. The organic carbon ranged from 0.45 – 0.52 percent with pH of 7.73 and mean electrical conductivity (EC) of 0.23 dSm^{-1}. Each plot size was 4 m x 5 m and seeds were sown in rows 20 cm apart. The experimental field was prepared by two ploughing with cultivator and finally planking to ensure a fine seedbed. Tall wheat variety C306 was sown by following recommended package and practices of CCS HAU with seed drill machine. All the other agronomic practices were applied uniformly to each plot. Chemical herbicides, Metsulfuron @ 8.0 gm/Acre with 200-250 litre water at 30 days after sowing were sprayed for the control of broad leaved weeds and narrow leaved weeds were controlled with Isoproturon (50% wp) @ 800 g/acre with 250 litre water at 37 days after sowing.

The biomass obtained from net plot was threshed, cleaned and weighed for grain yield in each subplot and grain yield thus obtained was converted into kg ha^{-1}.For hectoliter weight, we took the thrashed grain from each subplot and measured weight of grain per unit volume method expressed as kilograms per hectoliter. For grain appearance score we used the grain sample from each sub plot and visually observed for the size, shape, color and luster of the grain and provided score from 0-10. Protein content (%) in grain for each treatment was calculated by multiplying the percentage of nitrogen in grain with 6.25. For nitrogen analysis oven dried plant material (grain and straw) from each plot was grinded separately with grinder and analyzed for nitrogen as per Nessler's reagent method (Lindner, 1944). Cost of cultivation, gross returns (Rs./ha), net return, B:C (gross return/total cost of cultivation) and V:C (net return/ total cost of cultivation) of various treatments were calculated on the basis of data provided by department of Economics and Directorate of Farm, CCSHAU, Hisar. Green fodder yield (kg ha^{-1}) was recorded by cutting the sub-plots raised for dual purpose at 45, 55, 65 and 75 days after sowing and weighing it with an electronic balance and converted into kg $ha^{-1.}$

Results and Discussion

Quality parameters and yield

Delay in wheat sowing from 3rd week of October to 2nd week of November and cutting of wheat for fodder purpose at different times had decreased significantly the hectolitre weight and grain appearance score (Table 1). Among sowing times, 3rd week of October sown crop was recorded with significantly higher hectoliter weight (84.1 kg/hl), grain appearance score (6.7) and maximum protein content (11.0 percent). The reason of higher hectoliter weight and grain appearance in earlier planting dates might be due to more time available for growth, which ultimately resulted in higher quality parameters. Variation regarding nitrogen content in grain and straw among sowing times was found non significant due to same amount of nitrogen application in all sowing times. Yan *et al*. (2008) [14] also confirmed the positive effect of proper planting time on quality parameters. Delay in sowing of wheat from 3rd week of October to 2nd week of November significantly reduced grain, straw and green fodder yield of dual purpose wheat (Table 1). Among sowing times, the significantly higher grain, straw and green fodder yield (3862, 7194 and 20725 kg $ha^{-1,}$ respectively) were recorded with 3rd week of October sown crop. The reason of maximum yield obtained was probably the optimum growth factors (temperature and time) available to crop which resulted in enhanced crop growth, leaf area index and productive tillers as compared to late sown plots. These results are in line with Rahman *et al.* (2004) [12], who concluded that availability of optimum conditions of temperature, light and nutrients to earlier sown crop resulted in higher fresh forage production, while late sown plots were unable to carry out photosynthesis efficiently under low temperature and light conditions. These results are also in line with Arzadun *et al*. (2006) and Gaylon *et al*. (2004) [2, 5].

Cutting of wheat for fodder purpose had reduced significantly all quality parameters and yield compared to uncut. Among the cutting schedules, compared to uncut wheat maximum and minimum percent reduction in quality parameters and yield was recorded with cutting of wheat for fodder at 75 DAS and 45 DAS, respectively. With the delay in cutting of wheat for fodder purpose from 45 to 75 DAS, the percent reduction range of 4.4 -11.5 (protein content in grain), 0.8-2.6 (hectoliter weight), 14.7-24.4 (grain appearance score) and 2.1-36.0 (grain yield) was recorded compared to uncut wheat, but an additional green fodder yield of 5625-29233 kg/ha was obtained with delay the fodder cutting time from 45 to 75 DAS. The reason of reduction in hectoliter and grain appearance score due to late cutting of wheat might be removal of photosynthetic organs by clipping, which negatively affected source sink relationship. Among the cutting schedules early cutting (45 DAS) was recorded with significantly higher grain yield (4,005 kg ha^{-1}) and straw yield (7,195 kg ha^{-1}) while late cutting (75DAS) resulted with minimum grain yield (2,618 kg ha^{-1}) and straw yield (3,665 kg ha^{-1}) and the reasons of significant reduction of yield in cut plots was possibly due to removal of photosynthetic tissues that resulted in lower crop growth rate, grain weight and number of productive tillers and the reverse was true for no-cut treatment.

Economics

Data given in Table 2 revealed that delay in sowing of wheat from 3rd week of October up to 2nd week of November reduced gross return (from 155,451 to 121,803 Rs/ha), net return (from 81503 to 47854 Rs./ha) significantly, net return (from 81,503 to 47,854 Rs/ha), B: C (2.10 to 1.65) and V:C (from 1.10 to 0.65). The reasons for highest net return and B:C in early sown crop, was due to the significantly higher grain, straw yield and green fodder yield. Singh *et al*. (2005) also recorded higher net return and benefit cost ratio from the crop sown on 10th November than 25thNovember sown crop. Among cutting schedules, compared to uncut wheat, profitability in terms of gross return was found only upto 65 DAS, while in terms of net return fodder cutting of wheat was found profitable only upto 55 DAS compared to uncut wheat. Delay in cutting of wheat for fodder purpose from 45 to 75 DAS resulted with percent reduction range of 0.04 to 13.2 for B:C and 8.2 to 26.8 for V:C compared to uncut wheat. Among

cutting schedules, Cutting of wheat for fodder purpose at 55 DAS was recorded most profitable with gross return (144170 Rs. /ha with a increase of 4.6 percent over uncut), net return (Rs. 69671 with 2.5 percent increase over uncut), B:C (1.91 with 3.04 percent decrease over uncut but maximum among cutting schedules) and V:C (0.91 with 6.2 percent decrease over uncut but maximum among cutting schedules). These results are supported by the findings of Arif *et al*. (2006) [1] who concluded that income of the cut plots was higher than no-cut plots.

Table 1: Effect of sowing time and cutting schedule on quality parameters and yield of dual purpose wheat

Treatments		Nitrogen content (%)		Grain appearance score (10 scale)	Protein content (%)	Hectolitre weight Kg/hl	Grain yield (kg/ha)	Straw yield (kg/ha)	Green fodder yield (kg/ha)
		Grain	Straw						
A) Sowing times:	3rd week of October	1.7	0.3	6.7	11.0	84.1	3,862	7,194	20,725
	4th week of October	1.8	0.3	6.54	10.9	83.6	3,642	6,460	19,398
	1st week of November	1.7	0.3	6.05	10.5	83.1	3,364	5,594	17,168
	2nd week of November	1.6	0.3	5.81	10.1	82.5	3,166	4,900	16,098
	SEm+	0.03	0.04	0.10	0.1	0.3	33.7	39.0	95.8
	CD at 5%	NS	NS	0.3	NS	0.8	118.8	137.7	338
B) Cutting schedules	Uncut	1.8	0.3	7.55	11.3	84.5	4,093	7,895	0
	Cutting at 45 DAS	1.8	0.3	6.44	10.8	83.8	4,005	7,195	5,625
	Cutting at 55 DAS	1.7	0.2	5.86	10.4	83.3	3,710	6,338	14,313
	Cutting at 65 DAS	1.6	0.3	5.82	10.0	82.8	3,118	5,093	24,218
	Cutting at 75 DAS	1.6	0.3	5.71	10.0	82.3	2,618	3,665	29,233
	SEm+	0.03	0.03	0.10	0.1	0.2	43.3	60.5	68.9
	CD at 5%	NS	NS	0.20	NS	0.5	125.2	175.2	202.3

Table 2: Effect of sowing time and cutting schedule on Economics parameter of dual purpose wheat

Treatments		Total cost (Rs./ha)	Gross return (Rs./ha)	Net return (Rs./ha)	B:C	V:C
A) Sowing times	3rd week of October	73,948	155,451	81,503	2.10	1.10
	4th week of October	73,949	144,950	71,001	1.95	0.95
	1st week of November	73,948	131,248	57,300	1.77	0.77
	2nd week of November	73,949	121,803	47,854	1.65	0.65
	SEm±	-	3,542	3,281	0.047	0.047
	CD at 5%	-	12,496	11,574	0.167	0.167
B) Cutting schedules	Uncut	69,888	137,840	67,952	1.97	0.97
	Cutting at 45 DAS	73,589	141,501	67,912	1.89	0.89
	Cutting at 55 DAS	74,499	144,170	69,671	1.91	0.91
	Cutting at 65 DAS	75,422	139,602	64,180	1.86	0.86
	Cutting at 75 DAS	76,344	128,702	52,358	1.71	0.71
	SEm±	-	101	190	0.002	0.002
	CD at 5%	-	293	550	0.004	0.004

Conclusion

For dual purpose (both grain and green fodder), tall wheat (C306) sown during 3rd week of October and harvest at 55 DAS for green fodder purpose was found most profitable closely followed by 3rd week of October sowing and harvested for fodder at 45 DAS.

References

1. Arif MM, Khan A, Akbar H, Sajjad, Ali. Prospects of wheat as a dual purpose crop and its impact on weeds. J. Weed Sci. Res., 2006; 12(1-2):13-17.
2. Arzadun MJJ, Arroquy I, Laborde HE, Brevedan RE. Effect of planting date, clipping height, and cultivar on forage and grain yield of winter wheat in Argentinean pampas. Agron. J. 2006; 98:1274-1279.
3. Dove H, Kirkegaard J. Using dual-purpose crops in sheep-grazing systems. J Sci. Food Agri. 2014; 94:1276-83.
4. Dunphy DJ, Daniel MC, Holt ME. Effect of fodder utilization on wheat grain yield. Crop Sci. 1982; 22:106-109.
5. Gaylon MJ, Shaffer, Baughman T. Identifying the impact of planting date and seeding rate on dual-purpose and grain only wheat yields, 2004. Available online at http:// varietytesting.tamu.edu /wheat/ongoingresearch/2005/Morgan.
6. Hossain I, Epplin FM, Krenzer EG. Planting date influence, on dual-purpose winter wheat forage yield, grain yield, and test weight. Agron. J. 2003; 95(4):179-88.
7. ICAR-11WBR. Director's Report of AICRP on wheat and Barley 2016/17 Ed :- G.P. Singh. ICAR-Indian institute of wheat and Barley Research, Karnal, Haryana, India, 2017, 87.
8. Jarial S. An approach in disseminating dual purpose wheat technology: a case from Uttarakhand, India. Indian Res. J Ext. Edu., 2014, 14.
9. Kumar S, Kumar B. Thermal time requirement and heat use efficiency in wheat crop in Bihar. J. Agrometeorol., 2014; 16(1):137-139.
10. Lukuyu B, Franzel S, Ongadi PM, Duncan AJ. Livestock feed resources: Current production and management practices in central and northern rift valley provinces of Kenya Livestock Res. for Rural Develop, 2011, 23.
11. Naveed K. Enhancement of dual-purpose wheat productivity through agronomic techniques. Pak. J. Bot., 2013; 45:1299-1305.
12. Rahman MS, Islam MA, Haque, MS and Karim, MA. Effects of planting date and gibberellic acid on the growth and yield of garlic (*Allium sativum* L.). Asian J. Pl. Sci. 2004; 3(3):344-352.

13. Singh IV, Sardana and. Sekhon HS. Influence of row spacing and seed rate on seed yield of lentil (*Lens culinaris* L.) under different sowing dates Indian J. Agron., 2005; 50(4):308-310.
14. Yan CP, Zhang YQ, Zhang DY, Dang JY. Effects of sowing date and planting density on the grain's protein component and quality of strong and medium gluten winter wheat cultivars. J Applied. Ecol. 2008; 19(8):1733-40.