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Effect of nitrogen application and seed rate on fodder yield and grain productivity of dual purpose wheat (*Triticum aestivum*) cultivar 'VL 829' in North hill zone

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Abstract

A field experiment was conducted during 2003-04 and 2005-06 at Rice and Wheat Research Centre of CSK, Himachal Pradesh Krishi Vishvavidyalaya, Malan, to explore the possibility of obtaining additional green fodder from early sown dual purpose wheat. Nine treatments *viz.*, T1- cut at 85 d, T2- cut at 100 d, T3- cut at 85 d + 25% higher N, T4- cut at 100 d + 25% higher N, T5- cut at 85 d + 25% higher seed, T6- cut at 100 d + 25% higher seed, T7- cut at 85 d + 25% higher N+ 25% higher seed, T8- cut at 100 d + 25% higher N + 25% higher seed, T9-check (no fodder cut) were evaluated using early wheat cultivar 'VL 829'. In general, delayed fodder cutting on 100th day resulted in higher green fodder but reduced the wheat yield in comparison to cut on 85th day. Early cut (85th day) with 25 % higher seed rate resulted in only 5.4% (1.73 q ha^{-1} reduction in yield (T5) in 2003-04. Thus, it is concluded that farmers can get supply of green fodder during the scarcity period of January by cutting their early sown wheat variety 'VL 829' at 85 day.

Key words: Green fodder, cut, early wheat, seed rate, nitrogen, profitability.

Introduction

Wheat (*Triticum aestivum* L. emend. Fiori & Paol.) is the most important cereal crop of Himachal Pradesh. Out of 572 thousand hectares net cultivated area, wheat is presently being cultivated on 370 thousand hectares (67.4%). More than 80 per cent of area under wheat cultivation in the state is rainfed. Therefore, the most common forages like barseem, oats, shaftal etc. can not be grown to their fullest potential because of lack of irrigation. There is acute shortage of fodder during the months of January and February due to drought like situation during these months. The wheat variety 'VL 829' is fit for early sown conditions, which germinates on the residual moisture of *kharif* season. Chaudhary *et al.* (1994) reported 35.9 q ha^{-1} grains from early winter wheat 'Sapatdhara' in addition to 68.7 q ha^{-1} additional fodder yield. Similarly 'VL 829' is a cross between winter x spring, thereby, it has got regeneration capacity even after cutting for fodder. Therefore, present investigation was carried out to explore the possibility of obtaining fodder from this wheat variety and alleviating the yield by agronomic manipulations.

Material and Methods

Field experiments were conducted during *rabi* 2003-04 and 2005-06 on Himalayan acid *alfisols* at Rice and Wheat Research Centre, Malan (32°1'E 76°2'N 950 m above mean sea level, average annual rainfall 1,900 mm) of Chaudhary Sarwan Kumar Himachal Pradesh Krishi Vishvavidyalaya. The soil of the experimental site was silty clay loam in texture, acidic in reaction (pH 5.7) having available N 343.1 kg/ha, 20.1 kg P_2O_5 ha^{-1}, 111.5.0 kg K_2O ha^{-1}and 0.74% organic carbon. Nine treatments viz., T1- cut at 85 d, T2- cut at 100 d, T3- cut at 85 d + 25% higher N, T4- cut at 100 d + 25% higher N, T5- cut at 85 d + 25% higher seed, T6- cut at 100 d + 25% higher seed, T7- cut at 85 d + 25% higher N+ 25% higher seed, T8- cut at 100 d + 25% higher N+ 25% higher seed, T9- check (no fodder cut) were tested in randomized block design having 3 replications. The recommended dose of fertilizers for wheat i.e. 80 kg N, 40 kg P_2O_5 and 40 kg K_2O ha^{-1} was applied through Urea 46%, SSP 16% MOP 60%, respectively. Treatments involving application of higher nitrogen (25% N) received it as Urea topdressing with the receipt of rain after forage cut.

The crop was sown on 7th and 11th October in 2003-04 and 2004-05, respectively and harvested for grains in last week of April. The crop received 273.8 mm and 192.2 mm rainfall during the cropping seasons. Apart from the data on fodder production, the data on yield attributes (ears m^{-2}, grains spike^{-1}, test weight) and grain and straw yield were recorded at the harvest of crop. The fodder and straw yields were converted into equivalent wheat yield and added into the grain yield to obtain the wheat equivalent yield. The net profit under the different treatments was worked out by taking into account the prevailing costs of inputs and prices of output including the straw and green fodder.

Results and Discussion

Significant effect of treatments was observed on the fodder and grain yields during both the years (Table 1). Significant increase in fodder yield was recorded during both the years as the cutting stage was delayed from 85 to 100 d (T1 vs T2, T3 vs T4, T5 vs T6, T7 vs T8) except T7 vs T8 during 2005-06. Delayed cutting reducing the active crop growth period resulted in prolonged accumulation of photosynthates and hence higher fodder yield at 100th day fodder cut. In general, the fodder yield was more in 2003-04 compared to 2005-06, due to the differences in rainfall received; during 2005-06, 14.4 mm rainfall was received upto the first cut and almost drought like situation prevailed upto that stage. Whereas in 2003-04, 43.2 mm rainfall was received before first cut. Consequently, the fodder yield ranged from 35.02 to 74.27 q ha^{-1} in 2003-04 and from 16.60 to 34.64 q/ha in 2005-06.

The number of ears m^{-2} at maturity was not affected significantly during 2003-04, however, a reduction in ears per unit area was observed in low rainfall year (2005-06) as the cut was delayed irrespective of the agronomic manipulations i.e. additional nitrogen or use of more seed did not compensate the ears per unit area. The 1000 grain weight did not vary significantly due to different treatments. In 2003-04, T3 (cut at 85 days + 25% higher N) and T5 (higher seed rate) recorded statistically similar straw yields as the check treatment (T9). Fodder cut at 85 and 100 d without additional nitrogen or higher seed rate (T1 and T2, respectively) recorded significantly lower straw yield than no cut indicating advantages of top dressing of additional nitrogen or higher seed rate. In 2005-06, delayed cut recorded lower values of straw yield though the differences were not significant.

Wheat grain yield was significantly influenced by the treatments. Fodder cutting at 85 d (T1) resulted in 23.5% reduction in yield compared to check (T9) whereas reduction in yield due to fodder cut after 100th d (T2) was 28.9 %.The reduction was primarily due to the reduction in number of earheads per unit area. The agronomic manipulations i.e. application of 25% additional nitrogen after the cut or using higher seed rate compensated to various degrees. Therefore, in 2003-04, no cut (T9) recorded significantly higher yield being at par with T3 (cut at 85 d + 25 % higher N), T4 (cut at 100 d + 25 % higher N), T5 (cut at 85 d + 25 % higher seed), T7 (cut at 85 d + 25% higher N+ 25% higher seed) and T8 (cut at 100 d + 25% higher N+ 25% higher seed). Topdressing 25% higher N after cut at 85 d brought down the reduction in yield to just 10.5% and added 4.14 q ha^{-1} grains over untopdressed wheat (T1). The reduction in yield (28.9 %) due to fodder cut after 100th d (T2) was brought down to 10.7 % only with 25% additional N after cutting (T4). Use of 25 % higher seed brought down the reduction in grain yield due to fodder cut at 85 d to just only 5.4%. In 2005-06, check (T9) was at par with cut at 85 d (T1), cut at 85 d+ 25% higher N (T3) and T5 (cut at 85 d + 25% higher seed rate) or T7 (cut at 85 d + higher seed + higher N). Comparable fodder and grain yield has also been reported at Howalwag, Almora (Anonymous, 2005-06).

Wheat equivalent yield computed by taking into account the green fodder and straw yield revealed significant variation during 2003-04. Maximum yield (53.17 q/ha) was recorded in T5 (cut at 85 d + 25% higher seed rate), followed by T8 (cut at 85 d + 25% higher N + 25% higher seed rate). The fodder cut at 85 or 100 d resulted in 11.7% reduction in wheat equivalent yield. Compared to check additional 25% nitrogen or use of 25% higher seed rated resulted in 4.5 and 13.4% increase in wheat equivalent yield, respectively. In 2004-05, T3 and T5 recorded 24.1% and 14.8% more equivalent over check.Computation of net returns revealed that in 2003-04, T5 recorded maximum returns of Rs 37438 ha^{-1}followed by T8 (Rs 36731 ha^{-1}). In 2004-05, T3 recorded maximum returns of Rs 6669 ha^{-1} followed by T5 (Rs 5286 ha^{-1}).

Thus, it is concluded that farmers can get supply of fodder during the scarcity period of January by cutting their early sown wheat 'VL 829' at 85 days. The net profit from this practice (fodder cut) is increased by use of 25% higher seed rate or by applying 25% higher nitrogen.

References

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Table 1. Effect of nitrogen and seed rate on the fodder yield, yield attributes and yield *vis a vis* profitability of wheat cultivar 'VL 829'

Treatment	Ears m^{-2}		Grains $spike^{-1}$		Test weight (g)		Fodder yield (q ha^{-1})		Straw yield (q ha^{-1})		Wheat grain yield (q ha^{-1})		Wheat equivalent yield (q ha^{-1})		Net profit (Rs ha^{-1})	
	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
T1-Cut at 85 d	164	168	50	42	51.3	45.0	35.02	18.34	35.46	18.61	24.33	11.50	41.38	2044	25858	4923
T2-Cut at 100 d	212	139	48	43	51.3	47.5	47.00	30.67	33.79	14.53	22.63	9.46	41.38	19.44	25857	3919
T3-Cut at 85 d + 25% higher N	259	182	55	43	48.3	52.3	30.19	16.60	43.74	19.43	28.47	13.85	47.11	22.72	31062	6669
T4-Cut at 100 d + 25% higher N	248	154	50	42	50.8	48.0	40.55	34.64	40.16	18.75	28.42	8.74	47.90	20.72	31848	4665
T5-Cut at 85 d + 25% higher seed	229	191	51	38	49.4	53.6	52.49	20.70	44.96	17.42	30.09	12.00	53.17	21.02	37438	5286
T6-Cut at 100 d + 25% higher seed	233	156	51	40	50.6	48.4	74.27	30.56	36.22	14.31	23.07	9.46	47.51	19.35	31776	3623
T7-Cut at 85 d + 25% higher N + 25% higher seed	236	169	48	39	50.6	49.0	34.62	21.96	35.74	17.83	26.48	11.38	43.54	20.76	27282	4499
T8-Cut at 100 d + 25% higher N + 25% higher seed	219	130	51	40	50.0	47.2	73.20	25.35	42.87	13.68	26.72	9.27	52.99	18.02	36731	1764
T9-Check (No cut)	231	175	53	42	51.4	52.6	-	-	50.28	19.98	31.82	12.32	46.90	18.31	32584	3994
CD (P=0.05)	NS	33	NS	NS	NS	4.2	9.84	9.08	9.95	NS	5.67	2.36	6.87	NS	-	-

I : 2003-04 II: 2005-06