

Dual purpose wheat

for fodder and grain production

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Presently, India faces a net deficit of 35.6% green fodder, 10.95% dry crop residues and 44% concentrate feed ingredients. In India, more than 85% of the farmers are small and marginal with small land holdings and a small number of livestock. These farmers are unable to put the required area under green fodder due to scarce land resources as a result foodgrain crops get preference over fodder crops and generally farmers feed livestock with dry fodder and straw which reduce the overall productivity of milch animals. To overcome the green fodder deficiency, a simple technique of growing cereal crops like oats, barley and wheat serves dual purpose. It can provide nutritious green fodder with little detrimental impact on the eventual grain and straw yields. Wheat being dual purpose crop has greater potential to produce higher fodder and grain yield for ensuring food security and enhancing farmers' net income. During the early stage, the crop biomass can be used as green fodder then it regenerates as a normal crop to yield grains. Also, post-harvest dry straw provides major feed resources for dairy production in South Asia and is widely transacted and traded as dry fodder.

Keywords: Dual purpose wheat, Fodder, Nitrogen scheduling

LIVESTOCK is the backbone of Indian agriculture which contributes 4.11% to national GDP and 25.4% to agricultural GDP. India supports nearly 15% (535.78 million) of the world's livestock population. The National Commission on Agriculture recommended that a minimum 10% of the arable area in the country (about 16.5 million ha) should be under improved fodder crops to meet the green fodder requirement but the area under fodder production has been static for last two decades i.e., around 8.4 million ha. This is due to globalization and the area under food crops is more to feed the growing population. These farmers are unable to put the required area under green fodder due to scarce land resources as a result cereal crops get preference over fodder crops and generally, farmers feed livestock with dry fodder and straw which reduces overall productivity

of milch animals.

Wheat (*Triticum aestivum* L.) belongs to the family Poaceae, is the most important cultivated food crop in the world and the second most important food crop in India after rice. In India, it is cultivated under an area of 31.61 M ha with a production of 109.52 MT. At present, major wheat growing states are Uttar Pradesh, Punjab, Haryana, Rajasthan, Madhya Pradesh and Bihar. These six states contribute 94% to the total wheat production in India. It is a source of high-quality fodder, rich in protein, energy, and nutrients and low in fibre (Table 1). During the early stage, the crop biomass can be used as green fodder then it regenerates as a normal crop to yield grains. Also, post-harvest dry straw provides major feed resources for dairy production in South Asia and is widely transacted and traded as dry fodder.

Table 1. Green fodder and straw quality of wheat

Parameter	Green fodder (Early vegetative stage)	Straw
Crude protein (%)	23.3	3
Ether extract (%)	3.4	1
Crude fibre (%)	21.5	35.2
NFE (%)	40.2	50.8
Ash (%)	11.6	10
NDF (%)	58.1	74.2
ADF (%)	29.8	49.6
ME (Mcal/kg)	2.6	1.4

Source: Animal Nutrition Booklet – NDDB (2012)

Selection of appropriate variety is an important and decisive factor to realize the optimum yield of green fodder and grains from dual-purpose wheat. All genotypes do not perform well under dual purpose, since the suitable variety should have the capability of early bulking as well as good regeneration

after cutting. Varieties with high yield potential along with adequate nutrient management are two major factors that can increase fodder yield and quality.

Package of practices for dual-purpose wheat

Selection of varieties

The selected variety should have good crop biomass production ability at an early stage as well as good regeneration capacity after fodder cut. Some of the dual-purpose wheat cultivars are VL Gehun 829, VL Gehun 616, VL Gehun 818 and VL Gehun 840. These are majorly recommended for north western Himalayan region with 7-10% grain yield loss. The present-day high-yielding varieties can also be used for this purpose. Some of them are DBW 222, HD2967 and DPW 21-50. These varieties also yield green fodder at par with dual-purpose varieties with little reduction in grain yield.

Case study on varieties performance in fodder and grain yield of wheat

An experiment was conducted on different high-yielding varieties of wheat during 2021 at ICAR-NDRI, Karnal. The green fodder yield of dual-purpose wheat had been significantly affected by varieties. The higher green fodder yield was recorded with DBW 303 (138.17 q/ha) followed by DBW 187 (129.09 q/ha) and DBW 222 (121.91 q/ha). In fodder cutting treatment, higher grain yield was recorded with DBW 222 (47.23 q/ha) which was found



Fig. 1. Overview of the experimental field.

statistically at par with DBW 187 (45.95 q/ha), and lower grain yield was recorded with DBW 303 (41.25 q/ha).

In grain production only treatment (no fodder cutting), higher grain yield was recorded in DBW 303 (54.47 q/ha) followed by DBW 187 (53.35 q/ha) and DBW 222 (52.04 q/ha). Among the above varieties, the grain yield reduction due to fodder harvesting was around 8, 14 and 24%, in DBW 222, DBW 187 and DBW 303, respectively. The 25% higher dose of nitrogen after cutting for fodder was applied to crop to overcome cutting shock, and it helped in transition of vegetative buds to reproductive buds.

Time of sowing

Dual-purpose wheat can be sown early as it requires more time for regeneration to produce grains. Therefore, the optimum time for sowing is during the second fortnight of October.

Seed rate and spacing

The seed rate of dual-purpose wheat is more than grain purpose as it is grown for fodder purposes.

Seed rate of at least 125 kg/ha should be used. The seeds should be treated with *Azotobacter* to ensure initial good growth of crops. The row spacing of 20-22 cm is maintained. Usually, line sowing is done after seedbed preparation in furrows by the kera and pora methods. It is also done through the drilling method by using seed drills or seed cum fertilizer drills as it is extensively used these days.

Nutrient management

Dual-purpose wheat requires a fertilizer dose of 150-175 kg nitrogen, 60 kg phosphorous and 40 kg potash per hectare. If the field is deficient in micronutrients, then it is applied as per requirement. The full dose of phosphorous and potash as well as 1/3 dose of nitrogen should be applied at the time of sowing. Another 1/3 dose of nitrogen is applied at first irrigation i.e. at the time of crown root initiation stage (21-24 DAS) and remaining 1/3 dose is applied at the time of second irrigation (50-55 DAS). Another 25% of nitrogen is applied additionally after cutting of green fodder as it stimulates regrowth.

Water management

Irrigation management of dual-purpose wheat is almost similar to normally grown wheat. Pre-sowing irrigation should be given to check proper germination. After that, first irrigation should be given at the crown root initiation stage i.e., at 21 DAS. Second irrigation is to be given at 50-55 DAS as per climatic conditions and soil requirements. Third irrigation is given 4-6 days after harvesting of green fodder. Additional two irrigations are given at the flowering stage and grain filling stage.

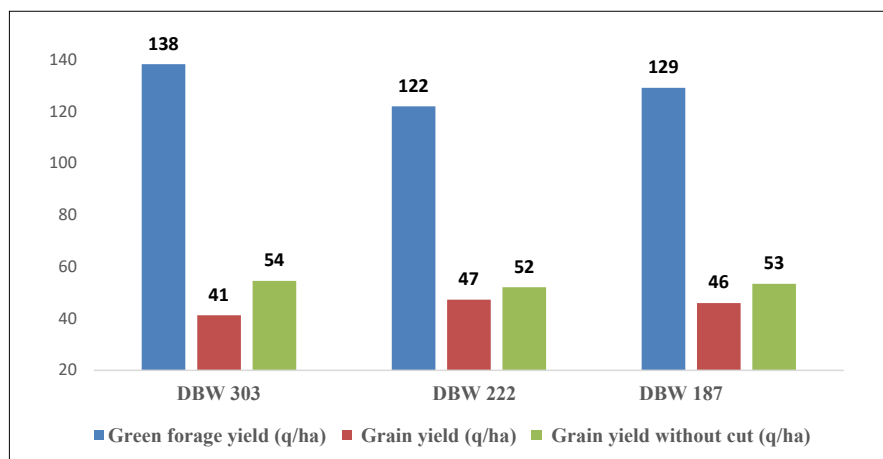


Fig. 2. Fodder vs grain yield of high yielding varieties of wheat.

Weed management

Pendimethalin @ 1250-1500 g per ha is applied at 0-2 DAS as pre-emergence for initial weed control in dual-purpose wheat. Post-emergent herbicides should be avoided as the crop is harvested as green fodder for animal purposes. Post-emergent herbicides may leave residue as there is less time interval between herbicide application and fodder cutting. It can be applied after fodder harvesting depending on the type of weed flora present in the field. Some of the post-emergence herbicides recommended are sulfosulfuron + metsulfuron 25+4 or its ready mixture 30+2 g/ha or application of clodinafop 60 g/ha or pinoxaden 50 g/ha or metsulfuron 4 g/ha.

Fodder harvesting

Timely harvesting of green fodder is necessary for re-growth and production of grains. The optimum time for harvesting of green fodder is 55-65 DAS. Before

this time, harvesting leads to poor yield and beyond this time, it leads to poor regeneration of crop. The crop should be harvested above 10 cm from ground level by using a sickle to ensure faster growth in pre reproductive stage. The average green fodder yield of dual-purpose wheat is 8-10 t/ha.

Care after green fodder harvesting

As the crop is cut for green fodder, it leads to the loss of crop biomass which is very necessary for photosynthesis. So first we need to recover the tillers and leaves of the plants. Almost 30-40 kg/ha of nitrogen is lost in the form of green fodder. So, to recover this amount, an additional dose of 30-40 kg of nitrogen is added after green fodder harvesting. This should be applied between 5-7 days after harvesting. Also, one irrigation should be given. The nitrogen must be applied just before irrigation for increased

nitrogen use efficiency.

Harvesting

Final harvesting is done similar to grain purpose wheat when the plant turns golden yellow. The grain becomes hard and the straw turns dry. The crop should be harvested when the plant attains physiological maturity and when the grain moisture percentage is around 18-20%. The grain yield reduces by 10-20% if not harvested on time.

SUMMARY

The selection of appropriate varieties, good nutrient management especially nitrogen and timely harvesting of green fodder of dual-purpose wheat is helpful to fulfill the green fodder and food security of livestock-based farming communities.

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