

Ryegrass:

A quality fodder for animals

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Ryegrass is a highly digestible, palatable forage and is suitable for animals with high nutritional requirements, including lactating dairy cattle. Ryegrass with good soil fertility provides rapid growth with regeneration capacity during periods of cool temperatures and when sufficient levels of soil moisture are available. The annual ryegrass requires well-fertile aerated soils, but has a remarkable ability to adapt to a wide range of soils. For ryegrass cultivation, soil should have high water retention capacity and a pleasant edaphic environment. Annual ryegrass quickly produces large quantity of fodder and is an outstanding forage crop that fits in many production systems like intercropping with different fodder crops (Berseem, Mustard, Lucerne, Oat/Barley, etc.). Ryegrass is generally grown pure stand and the intercropping strategies have a considerable impact on the fresh yield of ryegrass. High production capacity of ryegrass makes it a popular choice for extra feed like hay and silage.

Keywords: Fodder, Intercropping, Makkhan grass

RYEGRASS (*Lolium multiflorum* L.) is the most nutritious, multi-cut, succulent, and tasty grass on the planet and is commonly cultivated as green fodder and pasture for animals. Ryegrass is found all over the world, including North and South America, Europe, New Zealand, and Australia. Ryegrass is a short-lived grass with high palatability and digestibility, and its consumption in dairy cows is very high to support high levels of milk production.

Comprehensive information on ryegrass with an intercropping sequence is required for high-quality fodder production per unit area. Also, there is a need to increase knowledge about the effect of integrated use of organic and inorganic sources of nutrients for enhancement of yield and quality of fodder ryegrass and soil fertility in Indo-Gangetic plains which are cost-effective and eco-friendly. The availability of nutrients in the soil vs. demand by crops and pasture plants is the most constrained of all

soil nutrients. The optimal crop yield and higher herbage yield of ryegrass are not obtained with insufficient nutrients.

Nutritional quality

It is a leafy grass that produces highly palatable forage with 13–18% crude protein (CP), 48–52% NDF (neutral detergent fibre), 30–35% ADF (acid detergent fibre), 7–8% total ash, 2.0–2.5% ether extract (EE), and often exceeds 10–13% dry matter (DM). These characteristics enable grazing animals to maintain exceptionally high, dry matter intake levels resulting in their outstanding performance.

Climate

Ryegrass can be grown in different climates, although the ideal conditions are 18–25°C and 300 mm of evenly distributed yearly rainfall. It thrives in irrigated settings below 650 m elevation. Crop growth is significantly hampered if the winter temperature drops below 6–8°C even though it can withstand

greater temperatures with assured irrigation (especially in Indian conditions).

It can be grown as an annual or as multi-tillered perennial crop. The densely tufted plant height reaches up to 30–90 cm, but the average plant height is 50–60 cm with fine (7 mm) dark green leaves that are hairless on the underside, a blade folded about mid-rib in early shoots, and a dark green leaf base. The flower spikelets are 20 cm long with 10 florets per spikelet and its awnless lemma grows in zigzag rachis angles (flower stem). Seeds are fawn, flat, with a size approximately 6 mm long with a fibrous root system.

Soil and tillage

Ryegrass thrives in fertile and well-drained soils, but it has a remarkable ability to adapt to a wide range of soils. Because of their high water retention capacity and pleasant edaphic environment, heavy textured soils are thought to be superior. It grows best in soils that are high in calcium



Seed of ryegrass (Makkhan grass) at the time of sowing

and phosphorus. High yield potential, rapid establishment, and appropriateness are achieved with reduced tillage and wet soils. The crop can withstand mild acidity and crop growth is negatively affected by waterlogging. Ryegrass seeds are minute therefore, require a fine seedbed for proper germination and establishment. To obtain a fine seedbed, one rough ploughing followed by 2–3 harrowing is required. The soil having pH range of 6.5–7.0 is determined to be ideal for crop growth and development.

Seed rate and sowing time

Ryegrass grows throughout the winter season, i.e. *rabi* (September–December) because of the low temperature required for their germination and is never adopted as a summer crop in European countries and Afghanistan. Seed rate of ryegrass for solo sowing is 5–6 kg/acre and in combination with berseem is 2–3 kg/acre. For ryegrass, 12–15 kg/ha seed (according to Advanta Seeds Co.) and 8–10 kg/ha (according to Punjab Agricultural University, Ludhiana, 2021) are required to achieve a consistent plant population, especially for green fodder and seed production. As usual, 8–10 kg/ha seed rate is recommended. The ideal sowing depth is 0.5–1.0 inches. When using a seed drill, a spacing of 30–40 cm between two rows is ideal.

Varieties

Makkhan grass: Makkhan grass

is a highly nutritional, multi-cut annual grass. It is highly succulent and more palatable grass. Its feeding will improve milk production and greatly improve milk solids like fat. It is a winter forage crop therefore is highly suitable for hill and low-temperature areas and is suitable to sow from October–December.

Punjab ryegrass 1 (1991): It is a quick-growing variety with soft stems and leaves which are relished by animals. Its average green fodder yield is 325 quintals per acre in 5–6 cuttings from November–May.

Punjab ryegrass 2 (2020): It is a multi-cut, fast-growing, late flowering variety. Its leaves are long and broad. It has better fodder nutritional quality, especially *in vitro* dry matter digestibility than Punjab Ryegrass 1 variety. It gives 6 cuttings from November–May with a green fodder yield of 327 quintals per acre.

Intercropping with ryegrass

Intercropping annual ryegrass with legumes may boost the protein content of forages, leading to higher feed intake and milk production, and so enhancing herd management during the dry season. Ryegrass and berseem are a wonderful match when grown together. Added 2–3 kg ryegrass seed per acre with full seed rate of berseem or mixed 1 kg ryegrass seed per acre with the appropriate seed rate of berseem + oats or berseem + mustard mixture gives a high output of good quality fodder (Table 1).

Table 1. Ryegrass intercropping systems

Description	Average green fodder yield (q/ha)
Ryegrass	750
Ryegrass + Berseem	600–700
Ryegrass + Mustard	500–600
Ryegrass + Lucerne	600–800
Ryegrass + Oats/ Barley	450–600

Sowing methods (dry or wet method)

Fine seedbeds are used for ryegrass sowing because of its minute seeds. Seedbeds are flooded to a depth of 0.5–1.0 inches. The seeds are dispersed in standing water after mixing with the upper layer of soil. Rapid germination and the simple

establishment of young seedlings are obtained with this process. In the dry method, ryegrass seed is dispersed in a row using a seed drill, then covered with the plank, and watering is provided later.

Nutrient management

Nitrogen (N) is one of the most essential elements, limiting ryegrass leaf growth, biomass output, protein content, and quality. For normal soil, the recommended nitrogen, phosphorus, and potassium doses are 80 kg N/ha, 60 kg P₂O₅/ha and 40 kg K₂O/ha, respectively. The half dose of N was applied at the time of sowing and the remaining nitrogen was applied in split doses at 30 days interval. When soil is deficient in nutrients, application of 120 kg N/ha, 60 kg P₂O₅/ha and 40 kg K₂O/ha, respectively is recommended.

Water management

The three key stages for irrigation in ryegrass seed production are tillering, head formation, and seed filling. For the proper seedling establishment, a little watering is required after one week of seeding. In general, irrigation is required from October–February at 12–14 day intervals and from March–April at 8–10 days interval. Irrigation should be applied after each cutting to promote good tiller development.

Harvesting and yield

The first cutting of green fodder should be taken 60–65 days after sowing. Subsequent cutting should be taken at 25–30 days interval. In general, the crop is left for seed production after three cuts. For seed production, the date of the last cut is critical, and it varies on crop growth and weather conditions.

The experiment was conducted in Randomized Block Design (RBD) during the *rabi* season in 2021 at research field of the Agronomy Section, ICAR-National Dairy Research Institute (NDRI), Karnal, Haryana. Significantly higher plant height, green fodder yield, crude protein, ether extract, and total ash were recorded with 75% recommended dose of fertilizer (RDF) + 25% N farm yield manure

Table 2. Effect of nutrient management on growth, yield and quality of ryegrass

Sr. No.	Treatment	Plant height (cm)	Green fodder yield (q/ha)	Crude protein (%)	Neutral detergent fiber (%)	Acid detergent fiber (%)	Ether extract (%)	Total ash (%)
N1	Control (Absolute)	47.63	429.69	13.23	52.20	34.53	2.15	8.46
N2	100% RDF	57.36	613.66	14.59	49.98	31.81	2.53	10.04
N3	75% RDF + 25% N with FYM	56.80	570.50	14.36	50.34	33.79	2.52	9.69
N4	75% RDF + 25% N with FYM + PGPR	61.64	619.60	15.08	48.00	30.33	2.68	10.44
	SEm±	2.01	5.88	0.27	0.87	0.89	0.04	0.12
	LSD (P=0.05)	5.90	17.26	0.80	2.56	2.63	0.12	0.32

(FYM) + plant growth-promoting rhizobacteria (PGPR). Lower value of NDF and ADF were recorded with 75% RDF + 25% N FYM + PGPR

compared to the control. The higher value of NDF and ADF shows poor quality of fodder (Table 2).

Silage and hay

Ryegrass has a strong production capability of silage which makes it a popular choice for extra feed when hay supplies are predicted to be scarce. To produce high-quality fodder, ryegrass is intercropped with legumes to boost the protein content. Timely cutting of annual ryegrass is done to boost the quality-quantity of fodder. Silage quality is highly determined by the maturity stage upon harvest. Ensiled annual ryegrass has increased cow feeding in small-scale dairy production systems.

The forage of ryegrass can support high dry matter intake levels and is suitable for animals with high nutritional requirements. It is relatively easy to establish and is versatile in nature to be used as green fodder, silage, and in haymaking. It is an outstanding forage crop with various production systems like intercropping with different fodder crops. The nutrient combination of 75% RDF + 25% N with FYM + PGPR is cost-effective and produces high-quality fodder for ryegrass production in northern India. Thus, this combined nutrient application may be recommended as an economically profitable option for resource-poor farmers to harvest higher fodder production.



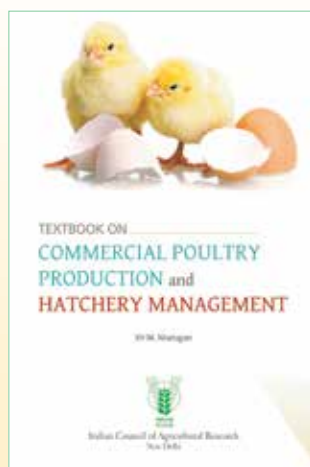
Experimental field of ryegrass (Makkhan grass) at ICAR-NDRI, Karnal, Haryana

SUMMARY

Ryegrass produces highly digestible and palatable fodder.

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