Phytology

Green biomass and seed production performance of different triticale genotypes in western terai region of Nepal

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Abstract

A field experiment was conducted at Directorate of Agriculture Research, Lumbini Province Khajura Banke Nepal during winter season from 6th November, 2019 to 30th March 2020 to estimate Green Biomass and Seed production performance of different Triticale Genotypes in western terai region of Nepal. Four triticale genotypes were tested in randomized complete block design with five replications to estimate for plant height, leaf length, leaf width, no of tiller per plant, no of leaf per plant, green biomass yield and Seed yield. There were highly significant variations in leaf width and significant in plant height, no of tiller per plant, no of leaf per plant, Seed yield and non significant variations found in leaf length and green biomass yields which indicated presence of high immensity of genetic variations. The genotypes Winter Max, Bolt and Cracker Jack are superior over other genotypes. They had produced maximum green biomass and seed yield (17.6, 3.562 ton/ha), (21.4, 2.97 ton/ha), (16.2, 1.97 ton/ha) respectively. They had manifested ascendancy in genetic diversity assessment and production performance of different perennial fodders. The high amount of genotypic diversity increased the number of genotypes that may be chosen. According to the findings, superior and ideal genotypes could be used in future breeding programs.

Keywords: green biomass, seed yield, production performance

Introduction

Agriculture is an integral component of Nepalese economy contributing to employment and income to Nepalese farmers and sustaining the economic growth of the country. A rapid increase in world population demand is concomitant with the increases of food production, particularly of cereal grains, the main source of nutrients for both humans and animals. However, further increases in cereal production must occur while preserving the environment and natural resources. Hill (1991) [8] coined that Triticale could become a major crop if, in addition to its use as a feed grain, it was cultivated on a large commercial scale for human consumption. Triticale can be milled into flour using standard wheat or rye flour-milling procedures (Kolkunova *et al*., 1983 and Weipert, 1986) [12, 21]. Triticale (X Triticosecale Wittmack), a human-made crop, is a hybrid small grain produced between wheat and rye. The name ‘‘triticale’’ is an international crop name, with variations in pronunciation to suit the local language and dialect and is derived from the combination of the scientific classifications of the two genera involved, that is, wheat (Triticum) and rye (Secale) (Mergoum *et al*., 2004) [13]. Triticale also has greater tolerance to common wheat diseases than wheat (Horlein and Valentine, 1995) [9]. Triticale grain also is high in essential amino acids, which makes it more nutritionally valuable than wheat, although the baking quality is inferior to that of bread wheat (Horlein and Valentine, 1995) [9]. Salmon *et al*. (2002) [17] discussed the importance of the high dietary fiber in triticale. High fiber content in food helps regulate blood glucose which is an advantage for individuals who are diabetic. Insoluble fiber assists in maintaining colon health and soluble fiber assists in reducing glucose release and absorption there by controlling blood cholesterol. In the same study, the lipid content of triticale was found to be significantly higher than in wheat. This is very important since components of the lipid fraction can have antioxidant activity and result in metabolic regulation of cholesterol. The trend of increasing population with the rapidly increasing demand has been more prominent in ruminant animals, populations of the ruminants are concentrated in the hilly areas of the country but the fodder and forest resources are depleting in a greater extent. Mahat (1987) pointed that in hill there is decline in forest and fodder supply due to steadily increasing livestock population, deforestation and uncontrolled livestock grazing. Big problem in livestock farming is inadequate supply of nutritious fodder for livestock production and maintenance (FAO, 2015) [4]. Wong *et al*. (1982) stated that forages are the single most important feed source for ruminants in worldwide. Triticale is a famous forage crop grown in many countries. Triticale is considered to be tastier and highly digestible grain for feeding pigs, chickens, cattle, sheep and deer (Kolev, 1967) [10].

Winter triticale contained proteins (10.2-13.5%), starch (53-63%), crude fibre (2.3-3%), free sugars (4.3-7.6%), ash (1.8-2.9%) (Heger and Eggum, 1991) [7].

The major feed resources in Nepal are agricultural by-products and forage (DoAR, 2020) [3]. Panday & Upreti (2005) [15] mentioned that forage crops are major sources of green matter for animal diet. Shrestha (2005) [19] illustrated that due to uneven production and supply of forage production and productivity of livestock goes down. There is excess green forage available during the monsoon period, but for the

remaining six months, over the winter and spring, there is a lack of feed. In commercialized farming situations farmers compensate for shortages of forages with supplementation of expensive concentrate feeds. The objective of this study was to accesses Green Biomass and Seed production performance of different Triticale Genotypes in western terai region of Nepal.

Methodology

The experiment was carried out at the research farm of Directorate of Agriculture Research, Lumbini Province, Khajura Banke, Nepal during winter season from 6th November, 2019 to 30th March 2020 to estimate Green Biomass and Seed production performance of different Triticale Genotypes in western terai region of Nepal. DoAR, Khajura is located at Janaki rural municipality-4 Banke district on the way to Nepalgunj to Gulariya road. Average annual rainfall of the station is 1000-1500 mm. The maximum and minimum temperature at the station is 46˚C and 5.40˚C, with relative humidity ranging between 27 to 94%. Humidity remains low for most of the duration of a year. The experiment was laid out in Randomized Complete Block Design (RCBD) with five replications consisting of seven perennial fodder genotypes (Table 1). The individual plot size was 18 m^2 (20 rows of 3m long) and spacing was 30 cm continuous. The soil texture was sandy to silty loam, poor in organic carbon and available nitrogen but medium in available phosphorus and potassium, soil pH varies from 7.2-7.5. The FYM @ 10 t/ha along with 80:60:40 kg N_2, P_2O_5 and K_2O ha^{-1} was applied in the experiments. Half nitrogen, full dose of phosphorous and potash was applied during sowing. Remaining dose of nitrogen is splitted into two parts and top dressed during 30 days after sowing and 45 days after sowing. Green biomass yield per hectare was deliberated by converting yield per plot into yield per hectare. The statistical package MSTAT-C was applied to analyze data (Russel & Eisensmith, 1983) [16]. The significant differences between treatments were determined at probability level of 0.01 or 0.05 using least significant difference (LSD) test (Gomez & Gomez, 1984) [6].

Table 1

S. N.	Name of Genotypes
1	Winter Max
2	Bolt
3	Cracker Jack
4	Local Check

Results and discussion

Table 2 illustrated that among tested Triticale genotypes the highest green biomass yield is obtained by Bolt (21.4 ton/ha) followed by Winter Max (17.6 ton/ha) and Cracker Jack (16.2 ton/ha). Similar finding was found in Kolev (2014) [11]. Similarly highest seed yield is measured by Winter Max (3.562 ton/ha) and followed by Bolt (2.97 ton/ha) and least Cracker Jack (1.97 ton/ha). Baychev (2004) [1] indicated the yield of triticale is 8.58 t/ha. Similar finding was found in SGRP (2017) [18]. Waratah Seed Company (2010) [20] indicated that two cultivars of triticale found higher green biomass and seed yield along dry-matter production. Similar result was obtained in grain yields up to 4.0 t/ha of the highest-yielding triticale cultivar and highest winter growth rates, dry-matter yield at maturity and grain yield were recorded from uncut plots. Farmer Community (2014) [5] noticed that cutting only in autumn had small negative effects on grain yields, but cutting in both autumn and winter reduced total dry-matter yields at maturity by 30%, and grain yields by 50%. Similar finding was obtained in cutting only in winter resulted in higher vegetative forage yields than a double cut (autumn and winter), but the single winter cut subsequently produced lowest dry-matter yields at maturity. Local Check have exhibited highest Plant height (74.5 cm), followed by Winter Max (69.4 cm), Cracker Jack (68.9 cm) and lowest plant height found in Bolt (54.4 cm). Local Check have manifested highest Leaf Length (30.84 cm), followed by Bolt (30.19 cm), Cracker Jack (29.17 cm) and lowest Leaf Length found in Winter Max (28.27 cm). Similarly, Cracker Jack have measured highest Leaf Width (1.796 cm), followed by Winter Max (1.558 cm), Bolt (1.188 cm) and lowest Leaf Width found in Para Local Check (1.071 cm). The Bolt have showed highest No of leaf Per Plant (47.3), followed by Cracker Jack (22.2), Winter Max (20.3) and lowest No of leaf Per Plant found in Local Check (17.1). The genotype Bolt have highest no of tiller per plant (9.38) followed by Winter Max (6.44) and Cracker Jack (6.21). Similar finding was observed in (DoAR, 2018) [2].

Table 2: Summary statistics of genotypes

Genotypes	Plant Height (cm)	Leaf length (cm)	leaf Width (cm)	No of leaf Per Plant	No of tiller Per Plant	Total Green biomass (ton/ha)	Total Seed Yield (ton/ha)
Bolt	54.6	30.19	1.188	47.3	9.38	21.4	2.97
Cracker Jack	68.9	29.17	1.796	22.2	6.21	16.2	1.978
Local Variety	74.5	30.84	1.071	17.1	4.58	15.2	2.393
Winter Max	69.4	28.27	1.558	20.3	6.44	17.6	3.562
Grand Mean	66.8	29.62	1.403	26.7	6.65	19.8	2.726
CV%	6.5	4.5	5.8	36	19.5	35.7	12.3
F Value	0.014	0.239	<.001	0.047	0.037	0.625	0.011
$LSD_{0.05}$	9.64	2.946	0.1813	21.4	2.884	15.72	0.7445

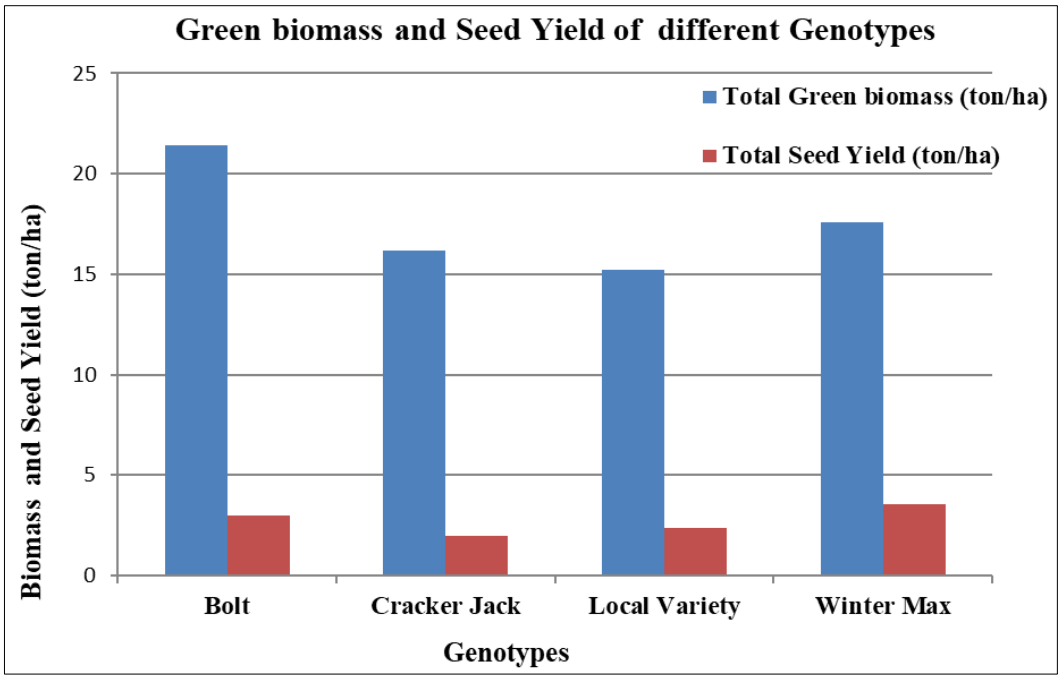

Fig 1: Total green biomass yield of different genotypes

The figure illustrated the total green biomass and seed yield of the genotypes. The genotype Bolt have produced highest green biomass (21.4 ton/ha) followed by Winter Max (17.6 ton/ha) and Cracker Jack (16.2 ton/ha). Similarly highest seed yield is measured by Winter Max (3.562 ton/ha) and followed by Bolt (2.97 ton/ha) and least Cracker Jack (1.97 ton/ha).

Conclusion

Triticale is important crop grown in many countries and cultivated in diverse agro-ecosystems. There was significant different among the tested genotypes in all traits. Result manifested ascendancy in all traits which indicated presence of high immensity of genetic variations. The genotypes Bolt, Winter Max, are superior over other genotypes. They produced > 17 mt/ha green biomass yield in all four cuts and >3 mt/ha seed yield. Thus, they were regarded as ideal genotypes to be candidates for further verifications.

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