Effect of harvest stage on forage yield and nutritional value of winter and spring triticale genotypes

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Introduction

Triticale grain is the first human made cereal created by 1875. It grows in most climates on acidic soils and in extreme temperature conditions. Moreover, the low value of triticale flour makes it a cereal mainly for animal feed as grain or forage (Varughese *et al*. 1987). It is well suited for dual purpose use (forage + grain + fodder or fodder, Ben Youssef *et al.* 2000) and as green forage, silage or hay (Delogu *et al*. 2001). In Tunisia, triticale was introduced by INRAT but its utilization has not been fully developed in Tunisia. The maximum sown area reached 20000 ha in 1992 and then dropped dramatically in 2002-03. There is a renewed interest for this species, particularly for feed use (as green forage or silage). Because of the uses of this cereal, it is necessary to study the nutritional value of triticale for different uses and varieties. In this trial, we evaluated the forage yield and the nutritional value of two new contrasting triticale types (spring – Tc1821 vs. winter – G41 triticale variety).

Methods

Winter variety G41 and spring variety Tc1821 were sown on an area of 25 m^2 (5m x 5m) with a spacing of 20 cm. Sowing was done on 1/11/2010. Estimating forage production was done by sampling 6 quadrats per plot of 0.25 m^2 (50 cm x 50 cm) at 3 stages - Z31, Z50 and Z85 according to Zadoks scale (Zadocks *et al*. 1974). From these quadrats a sample of 500g was dried and milled and nutritive value was assessed through chemical analysis of crude protein content (AOAC, 1984), Metabolic energy (ME), Digestible Organic Matter (DOM, Menke and Steingass 1988); neutral detergent fibres (NDF), acid detergent fibres (ADF) and acid detergent lignin (ADL) (AOAC 1984).

Results was performed using an analysis of variance according to the model: $Yijk = \mu + Ai + Bj + \varepsilon ijk$, In which μ= arithmetic mean; Ai = the effect of ith variety (j= 1,2 or 3), Bj = the effect of jth harvesting stage and εijk is the residual experimental error. Statistical analyses were carried out using the GLM procedure of the SAS Package (1995). Differences between the means of all the analyses were analyzed using the LSMEANS procedure.

Results and Discussion

Winter triticale (G41), which is supposed to have a great need for cold temperatures, could complete its life cycle from seed to grain. Despite its low grain yield (average yield 2 t/ha, data not reported) and thanks to its forage quantity and quality, G41 has major advantages as a forage resource. Yield parameters and forage quality measured at stage Z31 showed great forage potential of winter triticale (3.7 t DM/ha). This productivity exceeds that of all forage cereal studied in Tunisia including barley (Benyoussef *et al.* 2001), oats (Benyoussef *et al*. 2000a) and spring triticale (Benyoussef *et al.* 2000b). Forage quality at this stage is very high (CP>24%, ME>20 MJ/kg DM, OMD>60%). At a young stage, genotype G41 has a spreading habit and covers ground quickly. The Z50 stage which is marked by the appearance of the ear beards, marks the limit between the vegetative and reproductive development. The use of cereals at this development stage provides a real compromise between forage yield and high nutritional value for cereal forage. At Z31 and Z50 stages, winter triticale (G41) showed its superiority to spring triticale (Tcl821). First, at this stage, it produced more CP and ME per hectare than spring triticale. In cereals, Z85 is the stage of physiological maturity of grain. The grains are well constituted and filled with starch (an important source of energy) while the plant is still green. At this stage, the results obtained in our work showed that the type of winter genotype G41 maintains its superiority in terms of forage yield relative to the spring triticale Tcl821. Even if its forage quality undergoes deterioration to the Z85 stage more pronounced than in the case of the spring genotype, winter genotype (G41) produce more CP and ME per hectare than the spring genotype.

Conclusion

Winter triticale (G41) has major advantages as a forage resource.

References

AOAC, 1984. Official's methods of analysis association official analytical chemists. Washington, DC, 14th Ed.
Ben Youssef S. Felah M., Chakroun M, Omri N (2001). Etude de

l'aptitude à la double exploitation de quelques génotypes d'orge en Tunisie. *Fourrage* **209**, 509-521.

Ben Youssef S, Chakroun M, Gouhis F (2000a). Aptitude au déprimage de quelques génotypes d'avoine en conditions du sub-humide. *Annales de l'INRAT* **71**. 12-27.

Ben Youssef S, Hechmi N, Zarkouna MT (2000b). Etude de l'aptitude à la double exploitation de quelques lignées de triticales (X triticosecale, W.) en Tunisie. *Annales de l'INRAT* **73**, 105-123.

Chakroun M (2000). Oat breeding at INRAT, Tunisia. 6th International Oat Conference : PROCEEDINGS held at Lincoln University, Lincoln, NZ. Editor R.J. Cross, New Zealand Institute for Crop and Food Research..

Delogu G, Faccini N, Faccioli P, Reggiani F, Lendini M, Berardo N, Odoardi.M (2001). Dry matter and quality evaluation at two phenologic stages triticale grown in the Po Valley and Sardinia,Italy, *Field Crop Research* **74**, 207-215.

SAS (1995). SAS Institute. SAS user's guide: 6th ed. SAS Inst , Cary, NC 1995.

Varughese G, Barker T, Saari E (1987). Triticale. CIMMYT, Mexico,D.F.32 pp

Zadoks C, Chang T, Konzak F (1974). A decimal code for the growth stage of cereals. *Weed Research* **14**, 415-421.