



# **N** 16<sup>th</sup> **Workshop**

JUNE, 28<sup>th</sup> – JULY, 1<sup>st</sup> 2009  
TURIN, ITALY

## PROCEEDINGS OF THE 16<sup>TH</sup> NITROGEN WORKSHOP CONNECTING DIFFERENT SCALES OF NITROGEN USE IN AGRICULTURE

Editors:

Carlo Grignani, Marco Acutis,  
Laura Zavattaro, Luca Bechini,  
Chiara Bertora, Pietro Marino Gallina,  
Dario Sacco

The 16<sup>th</sup> Nitrogen Workshop was jointly organized by the Department of Agronomy, Forest and Land Management of the University of Turin and the Department of Plant Production of the University of Milan



UNIVERSITÀ DEGLI STUDI  
DI TORINO



UNIVERSITÀ DEGLI STUDI  
DI MILANO

Printed by  
Tipografia Fiordo s.r.l., Galliate (NO), Italy

Suggested citation

*Authors*, 2009. *Title*. In: C. Grignani, M. Acutis, L. Zavattaro, L. Bechini, C. Bertora, P. Marino Gallina, D. Sacco (Eds). Proceedings of the 16<sup>th</sup> Nitrogen Workshop - Connecting different scales of nitrogen use in agriculture. 28<sup>th</sup> June – 1<sup>st</sup> July 2009, Turin, Italy, pp. *nn-nn*.

ISBN 978-88-902754-2-5

ISBN Editor: Facoltà di Agraria, Università degli Studi di Torino

# NITROGEN USE EFFICIENCY OF SLOW-RELEASE FERTILISERS APPLIED IN A GRASS TURF OF A PUBLIC GARDEN

P. Magalhães<sup>1</sup>, M.A. Rodrigues<sup>2</sup>, M. Arrobas<sup>2</sup>

<sup>1</sup> Câmara Municipal de Valpaços, Portugal, paula.mag@sapo.pt

<sup>2</sup> CIMO - Mountain Research Centre, ESA-IPB, Portugal, angelor@ipb.pt

## Introduction

Slow-release, controlled-release and stabilized fertilisers are advised for several agro-environmental situations to improve nutrient use efficiency by reducing nutrient losses from the soil (Anon., 2007). Playing fields, nurseries, flower beds and in particular private and public gardens are important targets in the marketing strategies of the companies that sell this kind of fertiliser. The public and private entities that manage these spaces usually pay less attention to the costs of fertilisers than farmers. The maintenance of a permanent and homogeneous greenness of vegetation is desired for aesthetic reasons, and this goal could be better achieved by using fertilisers that release their nutrients more slowly. The recent huge increase in the diversity of brands of this type of fertiliser is such that the 'knowledge' on the subject seems to be dominated by the technical staff of the companies that manufacture these fertilisers, there having been a lack of independent studies on the subject.

In this work, the effects of three fertilisers that delay the bioavailability of nutrients on dry matter yield and N recovery were compared on a grass turf of a public garden. Treatments with a conventional fertiliser (ammonium nitrate) and without N (control) were also included. Based on field results several N use efficiency indices were estimated.

## Materials and Methods

In the growing season of 2008 (March to October) four fertilisers, and one control treatment, were imposed on a grass turf of the gardens of the city of Valpaços (North-eastern Portugal). The fertilisers used were: Floranid permanent 16-7-15 (slow-release, IBDU/Isodur fertiliser); Basacote plus 9M 16-8-12 (controlled-release fertiliser, copolymer ethylene acrylic); Nitroteck 20-8-10 (stabilized fertiliser, DCD as nitrification inhibitor + coating with polyterpene) and Nitrolusal (ammonium nitrate, 20.5% N), applied all at a rate of 120 kg N ha<sup>-1</sup>. Phosphorus and potassium rates were balanced among treatments by using superphosphate (18% P<sub>2</sub>O<sub>5</sub>) and potassium chloride (60% K<sub>2</sub>O). Nitrolusal was applied into two fractions of 60 kg N ha<sup>-1</sup>. The fertilisers were applied to the ground on 11 March 2008. The second fraction of Nitrolusal was applied on 10 July 2008.

The turf dry matter yield was determined from several sequential cuts throughout the growing season. Nitrogen concentration in turf dry matter was determined by a Kjeltex Auto 1030 Analyser. Based on turf dry matter yield and N recovery three indices of N use efficiency were estimated according to standard previously defined equations (Rodrigues and Coutinho, 1996; Fageria et al., 2008). One index of economic efficiency was also estimated based on the costs associated with each fertilisation treatment considering the prices of all the fertilisers at the beginning of the experiment. These indices were estimated as follow: Apparent N Recovery (ANR, %) = (Nuf - Nuc)/Na x 100; Agronomic Efficiency (AE, kg kg<sup>-1</sup>) = (DMf - DMc)/Na; Physiological Efficiency (PE, kg kg<sup>-1</sup>) = (DMf - DMc)/(Nuf - Nuc); Economic Efficiency (EE, kg €<sup>-1</sup>) = (DMf - DMc)/Cf, where, Nuf is the N recovery of the fertilised treatments (kg), Nuc is the N recovery in the control treatment (kg), Na is the quantity of N applied (Na), DMf and DMc are turf dry matter yields of fertilised and control treatments (kg), and Cf is the cost of the fertilisation of the corresponding treatment.

## Results

The turf dry matter yield in the control treatment was approx. three times lower than that recorded in the most productive fertilised treatments (Tab. 1). This means that the soil did not provide enough N for plant growth and also that the turf presented a high demand for nitrogen. The Basacote treatment produced significantly higher DM values than the control but also significantly lower DM values than the other fertiliser treatments. The differences among Floranid, Nitroteck and Nitrolusal were not statistically different. Nitrogen recovered in the control treatment was also approx. three times lower than that in the higher productive treatments (Tab 1). Nitrogen recovered in the Basacote treatment was not significantly different from that of the other fertiliser treatments. This means that Basacote might provide N to the turf but its effect on dry matter yield is less effective than the N provided from the other fertilisers. Thus, ANR of Basacote treatment was not greatly dissimilar to that of the other fertiliser treatments. Conversely, the AE and PE of Basacote were much lower than that of Nitroteck, Floranid and Nitrolusal. The EE index was also very low in Basacote treatment. Each euro spent with Basacote produces 1.24 kg DM whereas each euro spent in Nitroteck produces 9.30 kg DM. The lower EE index of Nitrolusal comparatively to Nitroteck (a compound fertiliser) is due to the supplemental cost of super 18 and KCl fertilisers used in Nitrolusal plots to balance the macronutrients among treatments. It is well known that the use of singular fertilisers is more expensive than the use of compound fertilisers.

Tab. 1. Turf dry matter (DM) yield, N recovered, N use efficiency indices and economic use efficiency of fertilisers.

Fertiliser	DM (kg ha <sup>-1</sup> )	N recovered (kg ha <sup>-1</sup> )	ANR (%)	AE (kg kg <sup>-1</sup> )	PE (kg kg <sup>-1</sup> )	EE (kg € <sup>-1</sup> )
Nitroteck	7732.5 a	132.4 a	78.5	44.4	56.5	9.30
Floranid	7854.8 a	129.0 a	75.7	45.1	60.0	4.40
Basacote	5929.0 b	121.4 a	69.4	29.4	42.3	1.24
Nitrolusal	7376.8 a	129.0 a	76.7	41.4	54.7	6.07
Control	2406.2 c	38.2 b	---	---	---	---

In columns, means followed by the same letter are not statistically different ( $\alpha < 0.05$ ).

## Conclusions

Basacote released their nutrients very slowly in comparison with the other fertilisers, including Nitroteck and Floranid as was previously shown in another study with tall cabbage (Santos et al., 2008). It seems that in these ecological conditions the efficiency to produce biomass increases if N is available early in the season, promoting the flush of spring. Nitrogen released late in the season was also taken up, increasing the N concentration in tissues but having a lower effect on DM yield. The sequential cuts of surf showed that N of Nitroteck and Floranid was available to the plants early in the season, and the effect on DM yield was similar or even slightly higher than that of Nitrolusal due to the fact that the former was split into two applications.

## References

- Anon. 2007. Fertilisers. Ulmann's Agrochemicals, Vol. I. Wiley-VCH Verlag GmbH & Co. KgaA, Weinheim.
- Fageria et al. 2008. The role of nutrient efficient plants in improving crop yields in the twenty first century. J. Plant Nutr. 31: 1121-1157.
- Rodrigues, M.A. and Coutinho, J. 1996. Efficiency of uptake and utilization of N from mineral and organic sources by potato crop. Proc. 4<sup>th</sup> ESA Congress, Veldhoven-Wageningen, pp. 368-369.
- Santos et al. 2008. Evaluation of slow release nitrogen fertilisers for tall cabbage grown in autumn. Italian J. Agron. 3(3): 61-162.