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CROPS' USE-EFFICIENCY OF NITROGEN FROM A MANURE ALLOWED FOR ORGANIC-FARMING

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Introduction

During the last decade, Europe has witnessed a fast development in the organic agriculture segment. This lead to the emergence of new markets for fertilisers allowed for organic farming. Taking into account the relatively high prices of some of these products it is essential to look into their fertilizing value. In this work, the agronomic behaviour of an organic amendment allowed for organic farming was compared to that of a conventional N fertiliser. We lay out results of crops N nutritional indices, N uptake and aboveground dry matter yields from a double-cropping system, which includes a mixture of small grains as winter cover crop and silage maize as summer crop.

Material and methods

The field trial was set at the Qta Sta Apolónia farm (Bragança, Portugal). The region benefits from a Mediterranean climate. Vegethumus® (Veg), an appealing pelleted organic amendment (C:N ratio of 11.3), and ammonium nitrate (AN), as conventional fertiliser, were used in the experiment. Five treatments consisting of two doses of each fertiliser and the control, with three replications, were arranged as a completely randomized design. As N nutritional indices, we used chlorophyll SPAD readings (SPAD-502 chlorophyll meter), stalk nitrate concentrations and leaf N concentrations. Dry matter yields were recorded from samples of 1 m^2 and 1.5 m^2 of cover crop and maize, respectively. The winter cover crop was sown on 29 October 2002 and mowed on 27 May 2003 for silage. Maize was sown on 12 June 2003 and mowed for silage on 18 September 2003. The maize crop was sprinkler-irrigated during the summer. Sidedress dates were 17 March and 17 July on cover crop and maize, respectively.

Results

Ammonium nitrate led to a significant increase in the SPAD[2] values, stalk nitrate concentrations, N uptake and dry matter yield of winter cover crop compared to control and Vegethumus (table 1). The results of Vegethumus were not different from control, even when using 80 kg N/ha.

Table 1 – Triticale N nutritional indices, N uptake and dry matter yield

N applied, kg/ha (basal+sidedress)	SPAD[1]	SPAD[2]	$StalkNO_3$[3] (mg kg^{-1})	N uptake[4] (kg/ha)	DM yield[4] (t/ha)
Veg. 40N (40+0)	41.5 a*	36.3 b	< 5	51 b	6.3 bc
Veg. 80N (80+0)	41.3 a	37.2 b	< 5	49 b	5.8 c
AN 40N (0+40)	42.3 a	49.9 a	< 5	75 a	10.4 a
AN 80N (30+50)	42.5 a	50.3 a	121.2	87 a	11.4 a
Control (0+0)	41.8 a	36.6 b	< 5	53 b	7.2 b
Anova (p)	0.918	0.000		0.000	0.000

*In each column, means with the same letter are not statistically different by Fisher's LSD test ($\alpha < 0.05$).

[1]March 17, Zadoks 31; [2]April 10, Zadoks 32; [3]May 5, Zadoks 55; and [4]May 27, Zadoks 75.

The results were similar for maize (table 2). Nitrogen nutritional indices seem to be very sensitive to inorganic N application. With Vegethumus, stalk nitrate concentrations were higher than the control ones at the first sampling date (before sidedresses) but the effect was lower than with basal application of 40 kg N/ha (AN 120 N) and did not last up to the second sampling date. Maize dry matter yield and N uptake were statistically higher with inorganic fertiliser and the organic amendment produced similar results as the control treatment.

Table 2 – Maize N nutritional indices, N uptake and dry matter yield.

N applied, kg/ha (basal+sidedress)	SPAD[1]	SPAD[2]	LeafN[1] ($g\ kg^{-1}$)	LeafN[2] ($g\ kg^{-1}$)	St.NO_3[1] ($g\ kg^{-1}$)	St.NO_3[2] ($g\ kg^{-1}$)	Nuptake[3] (kg/ha)	DM yield (t/ha)[3]
Veg. 60N (60+0)	47.7 a	42.2 b	29.6 a	19.8 b	13.8 b	0.3 b	105 b	17.6 c
Veg. 120N (120+0)	47.6 a	42.7 b	27.4 a	19.8 b	14.2 b	0.2 b	102 b	18.2 bc
AN 60N (0+60)	48.2 a	49.0 a	28.4 a	24.8 a	6.3 c	7.3 a	177 a	21.4 ab
AN 120N (40+80)	49.1 a	50.2 a	29.5 a	23.1 a	26.3 a	5.8 a	176 a	22.7 a
Control (0+0)	47.0 a	44.5 b	26.6 a	18.1 b	6.3 c	0.6 b	106 b	18.8 bc
Anova (p)	0.167	0.001	0.070	0.000	0.000	0.001	0.000	0.040

[1]July 17, 6-8 leaf stage; [2]July 29, 8-10 leaf stage; [3]September 18, Full Dent stage.

Discussion and conclusions

The low C:N ratio of Vegethumus suggests net mineralization (Jarvis et al., 1996). However, difficulties to foresee the balance of mineralization-immobilization process from C:N ratio often occur (McKeeney et al., 1995). In practical terms, the organic amendment doesn't show any capacity in supplying crops' N nutrition needs, despite its high price. We will wait for the long-term effect of this kind of slow release N fertiliser.

References

Jarvis, S. C. et al., 1996. Adv. Agron. 57: 187-235.
McKeeney D. J. et al. 1995. Soil Sci Soc. Am. J. 95: 118-124.