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## Effects of Different Nitrogen Levels on the Yield and Nitrogen Accumulation in the Rocket

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**Abstract:** This study was conducted with the objective assessing the effect of ammonium nitrate fertilizer applied 0, 100, 200, 300, 400 and 500 kg N ha<sup>-1</sup> on nitrogen uptake and accumulation of rocket plant in the field conditions. It was determined total nitrogen NO<sub>3</sub>-N, NO<sub>2</sub>-N contents of leaves. Highest yield was determined at the parcels that received 300 kg N ha<sup>-1</sup>. In this study, the highest leaf NO<sub>3</sub>-N (205.6-795.3 ppm) and NO<sub>2</sub>-N (0.019-0.154 ppm) contents was measured in the parcels that received the highest N (500kg ha<sup>-1</sup>) dose.

**Key words:** Rocket, nitrate, nitrite

### Introduction

Rocket is a very anthautic herbaceous plant consumed in many of the Mediterrean countries as a salad for its leaves and India and China as an oil crop for its seed (Vaughan, 1970), which is utilized in human nutrition and in drug industry (Vural *et al.*, 2000; Bianco and Boari, 1996).

Likewise spinach and lettuce exceeding concentrations of nitrite (NO<sub>2</sub>) and nitrate (NO<sub>3</sub>) in rocket leaves also threaten human health. Infact, methemoglobinemia kind of cancer risk increases.

It is analyzed high amounts of Nitrate of rocket in Italia market (Cerrutti *et al.*, 1996; Santamaria *et al.*, 1998b). Hakerlerler *et al.* (1993) and Venter (1978) reported that over fertilization with nitrogen (N) results in NO<sub>2</sub> and NO<sub>3</sub> accumulation in leaves.

The objective of this study to examine the NO<sub>3</sub> and NO<sub>2</sub> accumulations in rocket leaves fertilized under different rates of nitrogen.

### Materials and Methods

A trial was performed in the experimental fields one years of Odemis Vocational School, Ege University, where 5 rates of N(0-100-200-300-400 and 500 kg ha<sup>-1</sup>) were incorporated into 2 m<sup>2</sup> parcels, ½ at preseeded and the second half 40 days later in the form of ammonium nitrate. Phosphorus (P<sub>2</sub>O<sub>5</sub>) and Potassium (K<sub>2</sub>O) were applied at 150 kg ha<sup>-1</sup> rates in the forms of triple super phosphate and potassium sulphate, respectively. Rocket seeds were sown on 11.01.2001 harvested on 21.03.2001.

A soil sample was taken from the experimental field and analyzed according to standard methods (Bingham, 1949; Bremner, 1965; Lindsay and Norvell, 1978). Leaves were harvest and analyzed for their total N (Kacar, 1972), for NO<sub>3</sub>-N (Balks and Reekers, 1960) and NO<sub>2</sub>-N (Bremner, 1965 and Hildebradt, 1976). Yield was determined and statistically analyzed according to Acikgoz (1993).

### Results and Discussion

Experimental soil (Table 1) was slightly acidic in pH, poor in CaCO<sub>3</sub>(%), sandy loam in texture, poor in organic matter, total N (%) and had no salinity problem (Bouyoucos, 1962 and Loue', 1968).

Highest yield was determined at the parcels that received 300 kg N ha<sup>-1</sup> (Table 2). On the other hand, highest leaf N content (4.2-6.5 %) was measured in 500 kg N ha<sup>-1</sup> treatment. Infact, leaf N contents were found higher than the normal threshold values given by Bergmann (1988). Esiyok *et al.* (1998) report that the highest yield was obtained at the 160 kg ha<sup>-1</sup> N treatment and the highest leaf N was at the 240 kg ha<sup>-1</sup> treatment of the 20<sup>th</sup> harvest.

In this study, the highest leaf NO<sub>3</sub>-N (205.6-795.3 ppm) and NO<sub>2</sub>-N (0.019-0.154 ppm) contents was measured in the parcels that received the highest N (500 kg ha<sup>-1</sup>) dose. However, these values were lower than the measurements (1500mg kg<sup>-1</sup>, fresh weight) of Ruckebauer (1985). In this regard, Bergmann (1998) cited NO<sub>3</sub> contents of chicory and similar crops as 1500 mg kg<sup>-1</sup> (fresh weight). Result showed that enhanced N rates affected the yield, total N and NO<sub>3</sub>-N contents significantly at 1 % level.

Table 1: Physical and chemical properties of experimental soil

Parameters(%)	Value	Parameters (ppm)	Value
ph	6.35	P	7.2
CaCO <sub>3</sub>	0.98	K	180.0
Total salt	0.03	Ca	950.0
Organic matter	1.15	Mg	145.0
Sand	67.44	Na	50.0
Silt	6.56	Fe	14.0
Clay	26.00	Zn	0.9
Texture	Sandy Loam	MN	14.4
Total N	0.089	Cu	3.2

Table 2: The effect of nitrogen fertilization on yield and nitrogen accumulation in rocket

Doses (kg ha <sup>-1</sup> )	Dry matter (%)	Yield (g m <sup>-2</sup> )	Total-N (%)	NO <sub>3</sub> -N (ppm/FW)*	NO <sub>2</sub> -N (ppm/FW)*
0	7.83a	5583.3c	4.2b	205.6c	0.019
100	7.50b	7146.6abc	4.9b	372.6bc	0.038
200	7.48b	8076.6ab	5.3ab	552.6ab	0.062
300	7.45b	8793.3a	6.2a	636.6ab	0.078
400	7.40b	8583.3a	6.3a	646.3ab	0.086
500	7.34b	5880.0bc	6.5a	795.3a	0.154
LSD value	0.283	1791.121	1.192	312.373	NS

\* value FW=Fresh Weight, NS= Non significant

Means followed by the same letters did not differ significantly at 1 % levels of probability

Santamaria *et al.* (1998a) said that highest NO<sub>3</sub> contents in their studies were measured in the NO<sub>3</sub>: NO<sub>2</sub> (50:50) treatment. Moreover, highest yield and largest leaf areas were also determined in these same parcels. They also reported that NO<sub>3</sub>-N contents as 6440-6081 mg kg<sup>-1</sup> fresh material which are relatively higher than the results of our study. Similar results were found by Malakouti *et al.* (1999), who speculate a consistency between N rates and NO<sub>3</sub> accumulations in the plants. European Union Food Commission (CECSCF, 1992) states the daily acceptable intake level of NO<sub>3</sub> and NO<sub>2</sub> as 0-3.65 and 0-0.07 mg kg<sup>-1</sup>, respectively. Similarly, FAO and WHO Food Commission (IEFCA) report the weurege daily NO<sub>3</sub> and NO<sub>2</sub> intake of a 60 kg person as 220-440 mg and 16-32 mg, respectively (Corre and Breimer, 1979). Dich *et al.* (1996) claim that NO<sub>3</sub> intake the leafy vegetables should not exceed 72-94%. In conclusion, 300 kg N ha<sup>-1</sup> gave the highest yield. Even though no toxicity was measured, total N, NO<sub>3</sub>-N and NO<sub>2</sub>-N contents of the rocket increased parallel with the increasing N rates.

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