African Journal of Agricultural Research Vol. 7(16), pp. 2581-2583, 26 April, 2012
Available online at http://www.academicjournals.org/AJAR
DOI: 10.5897/AJAR11.2470
ISSN 1991-637X ©2012 Academic Journals

Short Communication

Potassium rates fertilizer effect on aerial part crambe nutrition

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Accepted 29 March, 2012

***Crambe abyssinica* is a winter brassica with high oil content showing great potential as a source of raw material for biodiesel production. As a winter crop with a short developmental cycle, 90 to 100 days, it is used as an off-season crop. This work was conducted in Umuarama County, Parana State, Oxisol Udic Dystrophic and aimed to evaluate the effect of potassium growing application (0, 15, 30, 60 and 90 kg ha^{-1}) used at the sowing of the crop. The application of potassium rates fertilizer resulted in a significant increase of this nutrient in crambe leaf tissue observed using leaf analysis.**

Key words: *Crambe abyssinica* Hoechst, biodiesel, fertilization, leaf analysis, potassium.

INTRODUCTION

On the world stage, the constant concern about the scarcity of non-renewable energy sources has encouraged the search for new sources of energy as biofuel, being that its use as a fuel has a promising potential all over the world (Nascimento et al., 2006; Herrera, 1995). Currently the industry uses soybean (*Glycine max*) oil as a source plant, followed by sunflower (*Helianthus annus*) and bovine tallow, but new sources are being studied (Brasil et al., 2007).

The crambe crop (*Crambe abssynica* Hoechst) is another alternative feedstock for biodiesel production. It is a plant in the Brassicaceae family from the Mediterranean region, occurring in Ethiopia (Weiss, 2000). The crambe crop has a good adaptation, precocity, rustic and its cultivation is fully mechanized and can be use the same equipment used in traditional crop production of grain (Pitol et al., 2010). Being considered as a winter crop and highly drought resistant, its establishment has a short cycle that ranges between90 to 100 days. Fits well in hot and cold soils and are pests and diseases resistant, with oil content of about 35%, without bark (Machado et al., 2007).

The oil from the grain of crambe can be applied in industry as lubricant and used as a corrosion inhibitor, and also in the manufacture of synthetic rubber due to its high erucic acid oil (50 to 60%). It can still be used in the manufacture of plastics, nylon, adhesives and electrical insulation (Oplinger et al., 1991).

In plants, the potassium is related to the synthesis of proteins and carbohydrates, sugars and starch storage and this stimulated the growth and improved utilization of water and the resistance to pests and diseases (Faquin, 1994; Malavolta et al., 1989).

Studies have shown that potassium is one of the most nutrients absorbed by plants cupuaçu butter and also what if exports in greater quantity with the fruits (Silva and Silva, 1986; Cravo and Souza, 1996).

The nutrient absorption by plants depends on the growth, efficiency of roots and the availability of nutrients in the soil (Silva et al., 2002). Leaf analysis can be used to evaluate the plant's nutritional status, since there is a correlation between the growth and the nutrient tissue status (Benton et al., 1990). From this correlation, maximum nutrient rates points are established, which correspond to the changes in plant production. These levels are called critical levels that delimit ranges of levels related to

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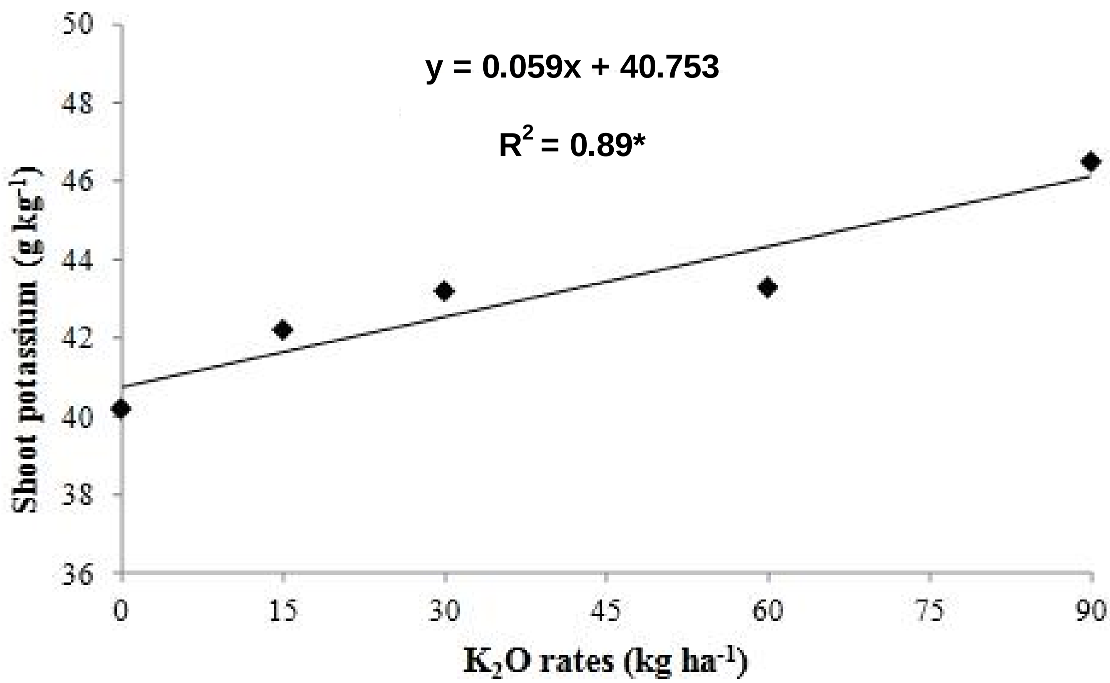

Figure 1. Potassiuum content in shoot of crambe plants as a function of K_2O rates on sowing time, * = significant at 5% error probability.

nutritional deficiencies at the appropriate levels or toxidez of minerals (Marinho et al., 2002).

As mentioned earlier, the aim of this work is to appraise the influences of potassium rates on the absorption of potassium in crambe crop.

MATERIALS AND METHODS

The experiment was installed at a farm in 2011 agricultural year in Umuarama city, Paraná state, located 53° 18' 48 West longitude and 23° 47 '55 South latitude and 430 m above sea level. The city climate is humid subtropical mesothermic and has an average annual temperature of 22.1°C. The local soil is an Oxisol Udic Dystrophic (Usa, 1998).

The experimental design was a Randomized Complete Block (RCB) with five treatments, using K_2O fertilization rates at (0, 15, 30, 60 and 90 kg ha^{-1}) with four replications. Potassium used was the potassium chloride, brand Darrow®. All plots received a uniform nitrogen fertilization of 20 kg ha^{-1}, brand Nuclear (urea) and 60 kg ha^{-1} of phosphorus (Triple Superphosphate), agreeing with (Pitol, 2008).

The parcels were composed of four rows with four meters long, spaced for 0.25 m, considering how useful the two central lines area, deleting 0.5 m at both ends. The sowing was done in May 13, 2011, with the *Crambe* FMS-Brilhante cultivar, and the seeds were originated from the foundation of Mato Grosso do Sul – FMS, aiming to obtain population of 400 plants per parcel, containing 25 seeds per meter.

Ninety days after plant emergence, the plants were harvested from 0.25 m^2 of floor area of each plot, dried in an oven with forced ventilation 55 to 65°C for 48 h. After this period, samples were drawn out for the analysis of phosphorus remaining in the *crambe* aerial part. The methodology used was that described by Malavolta et al. (1997). Statistical analysis was performed followed by variance model analysis, using the 5% significance level. Mean phosphorus rates were compared by polynomial regression at the same significance level.

RESULTS AND DISCUSSION

The application of potassium rates fertilizer in soil resulted in the increase of potassium in the leaf of crambe crop (Figure 1). Different results was observed by Mascarenhas et al. (1980), working with potassium rates fertilizer at (0, 20, 40, 60 e 80 kg/ha de K_20) in the soybeans crop in Guaira city and Bento Quirino city, located in the area pre-deforested of cerrado. They observed that in the first agricultural year, the application of potassium in soil has not increased the levels of this element in the leaf while in the second and third agricultural year; they observed that there was reduction in potassium rates in the leaf.

Agreeing to Black (1968), the plant can extract the exchangeable potassium and when it is insufficient, the plant will continue absorbing potassium as observed in this experiment. How the potassium rates was insufficient for plant, it continued extract potassium soil while grow the potassium rates in the soil.

Scherer (1998), appraising the response of the soybean crop to fertilization of potassium, observed that there was a reduction in the levels of potassium in leaf tissue because of successive extraction by the crops, which may have led to the exhaustion of the soil. He also defined four tracks of the levels of potassium in leaf tissue in accordance with the availability of potassium in soil (0, 20, 40, 60, 80 and 100 mg. m^{-3}), being very low when the leaf potassium is less than 9 g. kg^{-1}; low, between 9 and 12 g. kg^{-1}; medium, between 12 and 14 g. kg^{-1} and high, when above 14 g. kg^{-1}.

This experiment used potassium chloride versus other sources because of product availability in the region where the experiment was conducted and this source is cheaper than other sources as potassium nitrate.

Conclusion

The application of potassium in the soil influenced its absorption by the plant. In other words, higher potassium rates in the soil led to greater absorption of nutrients by the plant. So Increased soil potassium increases tissue potassium in a linear fashion.

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