Potassium nitrate: the right choice for onion production

Balanced plant nutrition, at the right time, is the key to optimizing yield and quality in onion production. Maintaining the correct balances is a management practice that is easily attained. Soil sampling is an essential management tool to determine the correct ratios of nutrients to be applied.

Typical fertilizer application rates will depend on the soil type, soil analyses and the expected yield. Nitrogen rates of between 130 to 200 kg per hectare (ha) and potassium rates of between 60 and 250 kg per ha for a high-yield onion crop on clay and sandy soils – with high- and low nutrient levels respectively. All elements are important, but after N and K^{+}, the positive cation Ca^{++} is also taken up in relatively high quantities.

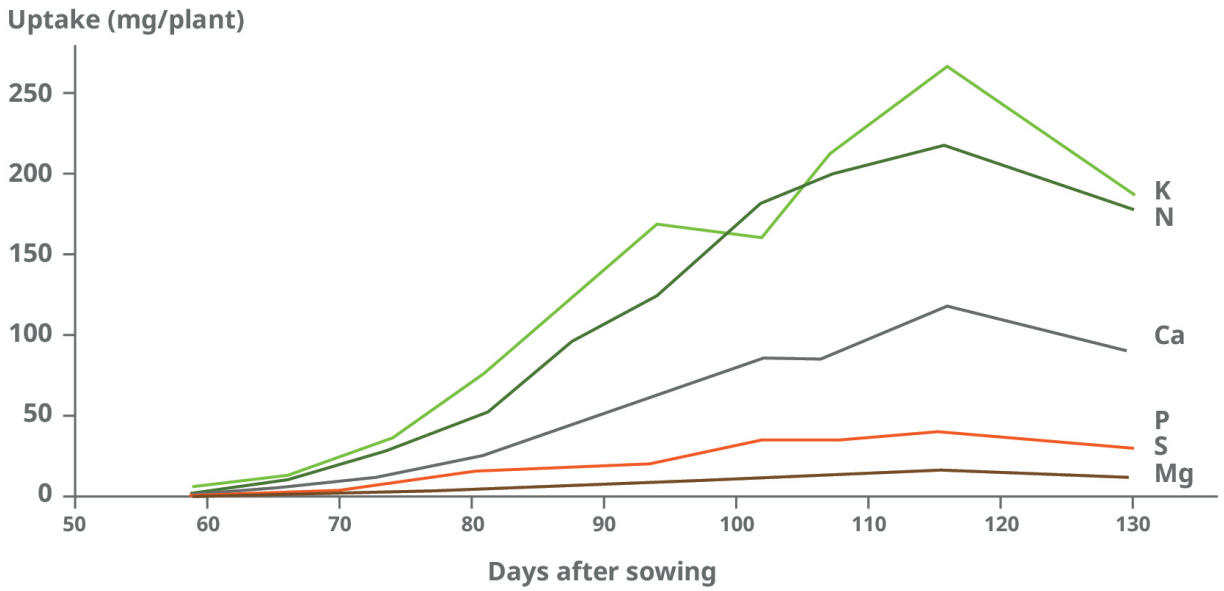

Figure 1. Nutrient element uptake in onion.

It has been documented that onions are highly susceptible to root zone salinity as well

as high chloride levels, with plant weight decreases of up to 50% with high salinity and more than 10% yield losses with high chlorides. Although a certain amount of sulphur (as SO_4^{--}) is needed in onions for pungency development (pyruvic acid content), supplying all the K as potassium sulphate will lead to very high excesses of sulphate, causing rootzone salinity build-up and yield losses. Potassium chloride is not recommended because of the chloride fraction.

Potassium nitrate has the lowest contribution to rootzone salinity as both elements are used in high amounts.Furthermore, it is important to note that onions have a shallow fibrous root system and that generally, especially in sandy soils, up to three topdressings of N and K are recommended for optimum yields.

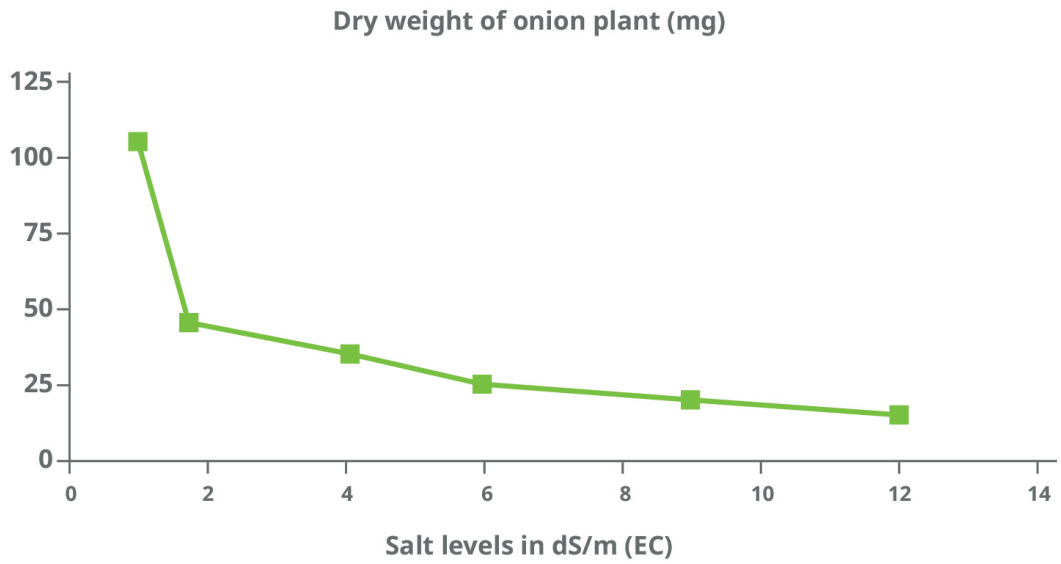

Figure 2.Onion dry weight as affected by root zone salinity.

Eighty percent of nutrients supplied to the onion plant end up in the bulb. Carbohydrates produced by the leaves are also translocated from the leaves to the

bulb during bulb formation. It has been documented that the uptake of the all-important cations K^{+}, Ca^{++} and Mg^{++} are enhanced with nitrogen in the nitrate form. Potassium nitrate helps to increase the relative ratio of nitrate to ammonium of the total N.

Excess ammonium nutrition (ammonium or urea-based fertilizer) should be avoided, as the NH_4^{+} cation will not only interfere or compete with the other cation uptake but can also lower the rhizosphere (soil near the roots) by as much as 1,5 pH units. Since pH is a logarithmic scale, the pH reduction near the roots can be in the order of 10 to 100 x more acidic than it should be.

In all horticultural crops, dry matter accumulation is great-est (up to double in certain cases) when nitrate-N is the preferred nitrogen source. Ammonium is converted to organic compounds exclusively in plant roots. This conversion is energy inefficient, requiring carbohydrate energy translocated from the leaves. The conversion of nitrate-N to organic compounds in the leaves is largely driven by light energy and is thus energy efficient, leaving more carbohydrates for dry matter accumula-tion by the crop and especially for translocation to the bulb in an onion crop. This results not only in higher yield but also in lower weight loss after storage.

For optimum yield, quality, better size class and storability, growers should generally aim for the ratio of 75% nitrate to 25% ammonium of the total nitrogen applied. Potassium Nitrate helps to achieve this desired ratio.

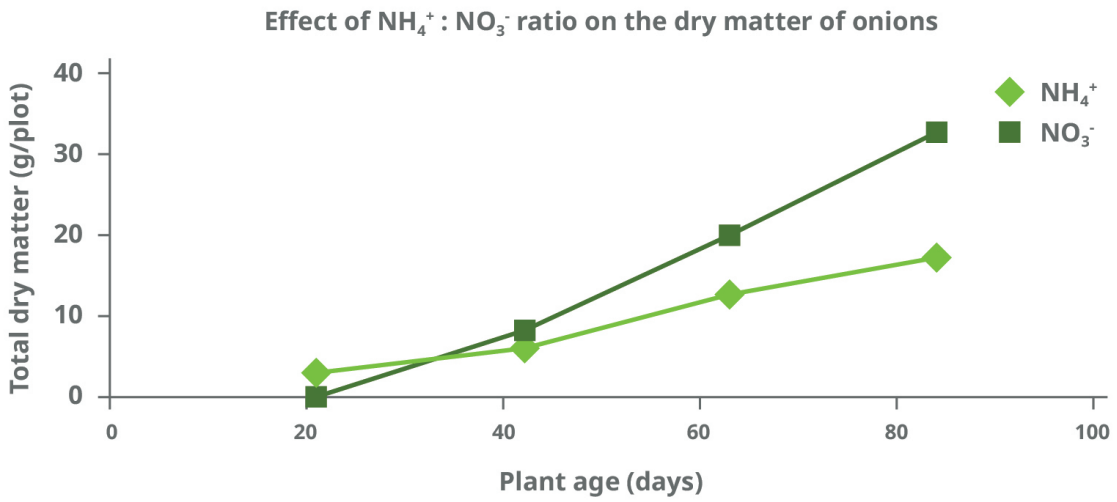

Figure 3. Growers should generally aim for the ratio of 75% nitrate to 25% ammonium of the total nitrogen applied.

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*** All claims in this article can be substantiated with references which can be made available on request.*