Potassium nitrate benchmarking with potassium sulphate

The importance of adequate potassium supply for plant development and yield production is well known, and the importance of chloride-free K is also understood. However, not all K sources are equal. Potassium nitrate offers substantial benefits, compared to sulphate of potash (SOP) (Haifa, 2009).

Potassium nitrate, compared to potassium sulphate, offers the benefits of:

- Favourable plant nutritional composition.
- Better performance as K source.
- Higher solubility and faster dissolution rate.
- Full-range compatibility with other fertilisers and agrochemicals.
- No interference with plant uptake of other ions.
- Lower content of residual chloride.
- Minimal effect on soil pH.
- Minimal contribution to soil salinity.
Plant nutritional value

Potassium nitrate contains 13 % nitrogen (N) and 46 % potassium (K\textsubscript{2}O). Both are macronutrients, consumed by the plant at high rates.

SOP contains 50 % potassium (K\textsubscript{2}O) and 54 % sulphate (SO\textsubscript{4}). The normal SO\textsubscript{4}/K\textsubscript{2}O ratio in the plant is 1:20. Thus, SOP leaves considerable amounts of excessive sulphate.

Solubility: higher and faster

The solubility of potassium nitrate in water is much higher than that of SOP (Table 1). Furthermore, the solubility of potassium nitrate increases as water temperature rises, while the solubility of SOP is almost constant.

Table 1. Solubility of potassium nitrate compared to potassium sulphate at different temperatures.

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<tr>
<th>Fertiliser</th>
<th>Temperature (°C)</th>
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Fertiliser

Temperature (°C)
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<th>Temperature (°C)</th>
<th>Solubility (g/1000g water)</th>
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<tr>
<td>10</td>
<td>219</td>
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<td>20</td>
<td>316</td>
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<td>30</td>
<td>456</td>
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<td>40</td>
<td>639</td>
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</table>

**Solubility (g/1000g water)**

Potassium nitrate

219

316

456

639
Another advantage of potassium nitrate is its dissolution rate: potassium nitrate dissolves much faster than SOP. High solubility and fast dissolution makes potassium nitrate ideal for preparation of fertiliser solutions – at any temperature.
Compatibility

Potassium nitrate is compatible with all other fertilisers, while SOP should not be mixed with calcium containing fertilisers, as these mixes form insoluble precipitates (gypsum) that will clog water passes and emitters.

Sulphate fertilisation

In most situations, the sulphate in the soil and irrigation water, together with the sulphate obtained from fertilisers, such as ammonium sulphate and magnesium sulphate, provide the plant requirements. When additional S fertilisation is required, it is recommended to use a mix of potassium nitrate and potassium sulphate at the required SO$_4$/K$_2$O ratio.

Reference:
