FACT SHEET
APRIL 2025

MAP AND DAP

Monoammonium phosphate (MAP) and Di-ammonium Phosphate (DAP) are high analysis compound fertilisers used as a source of nitrogen (N) and phosphorus (P). Ammonium phosphates have been produced since the 1960's and have become the leading sources of phosphorus worldwide, as they have the highest phosphorus analysis of any synthetic fertilisers.

MANUFACTURE

Ammonium phosphates ($NH_4H_2PO_4$) MAP and DAP are produced through the reaction of ammonia and phosphoric acid, resulting on the formation of mono-basic and di-basic salts. The ratio of ammonia (NH_3) to phosphoric acid (H_3PO4) determines which product, monoammonium phosphate (MAP) or diammonium phosphate (DAP), is produced. If the ratio of nitrogen from ammonia and phosphorus from phosphoric acid is 1:1, mono-ammonium phosphate ($NH_4H_2PO_4$) is produced and when the ratio is 2.0, di-ammonium phosphate $(NH_4)_2HPO_4$) is produced. These reactions are summarised below:

MAP $NH_3 + H_3PO_4 \rightarrow NH_4H_2PO_4$

DAP $2NH_3 + H_3PO_4 \rightarrow (NH4)_2HPO4$

The neutralisation of ammonia and phosphoric acid results in the production of slurry which is then cooled and fed into a rotary granulator, tumbling to form a solidified granule. The tumbling of this dried product results in spherically round and polished fertiliser granules which are then sized to 2 - 4mm. Under and oversized granules are crushed and re-tumbled to form the correct size. The granules undergo a further drying and cooling to reduce caking in storage and produce a high crush strength to reduce degradation from product handling.

ANALYSIS AND USE

MAP is a high analysis (10% N, 21.9% P), cost effective fertiliser predominantly used in cropping and pasture systems. MAP is preferred to DAP in situations where there is risk of ammonia toxicity to germinating seedlings and is commonly used as a 'starter' fertiliser. MAP is more commonly used when fertiliser placement is in direct contact with the seed of emerging crops, particularly those sown on wide row spacings.

DAP is the most economical phosphorus fertiliser. It has a high analysis (18% N, 20% P), allowing freight and handling costs per kg of nutrient to be minimised. DAP is the world's most traded and used phosphorus fertiliser. DAP is more commonly used in fertiliser blends and in the sugarcane, vegetable, horticultural and pasture industries.

Table 1: Analysis.

Product	% Nitrogen (N)	% Phosphorus (P)
MAP	10	21.9
DAP	17.7	20

BLENDS AND STORAGE

DAP is the preferred phosphorus source in most blends. It is used in horticulture, sugarcane, and nitrogen-fertilised grass pasture. MAP is less commonly used in blends than DAP, except for dryland cropping areas and cotton.

MAP is preferred to DAP where:

- there is a need to minimise the amount of nitrogen placed in direct contact with or near the seed, reducing the risk of fertiliser toxicity; and / or
- the blend is to be stored prior to use. DAP is more hygroscopic than MAP and therefore more prone to setting in storage.

Note: it is recommended that fertiliser not be stored in silos. DAP and blends containing DAP should be used immediately.

Most fertiliser products cake in storage. The degree to which this occurs depends on the product, how and where it is stored and the length of time in storage, the product's moisture content, granule shape and hardness, the presence of fines and dust, atmospheric humidity, and the temperature. At the surface of granules, the fertiliser can dissolve, form chemical bridges with adjacent fertiliser particles and re-crystallise, cementing the granules together. Blends do not store as well as the ingredients from which they are made, and the more blend ingredients used, the worse the storage characteristics become. Blending fertilisers causes chemical reactions which may occur at the interface between granules, resulting in the formation of more troublesome fertiliser salts.

Fertiliser blends and storage are determined by the Critical Relative Humidity (CRH). CRH is the relative humidity (at a given temperature) above which a fertiliser readily absorbs moisture from the atmosphere, and below which it will not absorb atmospheric moisture. In general, the higher the CRH, the less likely the fertiliser is to absorb moisture and the better the storage characteristics.

Table 2: Critical Relative Humidity (%) of Pure Fertiliser Salts MAP and DAP at 30˚C

Salt	Product	CRH
Monoammonium Phosphate	MAP	70-75
Diammonium Phosphate	DAP	<70

Table 3: Critical Relative Humidity of Urea in Blends

Salt	CRH	CRH in Blends with Urea
Monoammonium Phosphate	70-75	65
Diammonium Phosphate	<70	62

The Critical Relative Humidity of blends is at best equal to and often lower than that of the blend ingredient with the lowest Critical Relative Humidity. Certain blends have a Critical Relative Humidity well below that of the ingredients. They rapidly absorb moisture. The ammonium phosphate fertilisers (MAP and DAP) are commonly used as sources of phosphorus in cropping fertilisers. Of the two, DAP has the higher nitrogen content and the lower CRH. It is more likely to absorb moisture than MAP.

Consequently, blends containing DAP are more likely to set in storage than blends containing MAP. For this reason, it is recommended that DAP, and blends in which it is used should not be placed in silos.

Table 4: MAP and DAP blend compatibilities **Note**: If a product is not listed in this table, it should be regarded as being incompatible to MAP & DAP.

	Compatible		**Limited Compatibility**
MAP	Urea	Sulphur Bentonite	Kieserite
	Gran-Am®	Granubor	Cal-Am® (Restrictions apply)
	DAP	Copper Granules	
	SuPerfect®	Zinc sulphate Monohydrate	
	Muriate of Potash	Granulock® Big Z	
	Sulphate of Potash	Manganese sulphate	
	Granulock® Blue	Iron Oxysulphate	
DAP	Urea	Sulphur Bentonite	Kieserite
	Cal-Am®	Granubor	SuPerfect®
	Gran-Am®	Copper Granules	Magnesium Oxide
	MAP	Zinc sulphate Monohydrate	
	Muriate of Potash	Granulock® Big Z	
	Sulfate of Potash	Manganese sulphate	
	Granulock® Blue	Iron Oxysulphate	

MANAGEMENT

There is often little difference in MAP or DAP as a phosphorus fertiliser source, with some exceptions occurring on calcareous soils and high P fixing soils. The differences between MAP and DAP are often associated with granule dissolution pH in (water) around the fertiliser band or granule. Dissolution of MAP occurs around pH 3.5 and pH 7.5 for DAP and is suggested that MAP is best suited on alkaline soils and DAP is best suited on acidic soils. Application method can also determine management and fertiliser choice. DAP can be more prone to nitrogen loss on alkaline soils when broadcast via ammonia volatilisation due to the high soil pH.

Many commercial decisions to choose MAP or DAP are determined by whether the fertiliser is going to placed in proximity to germinating seedlings, depending on the seeding equipment and seed bed utilisation (SBU). While seed placed fertiliser is an efficient means of supplying phosphorus to emerging crops, predicting fertiliser toxicity and exactly how much damage will occur is often hard to determine.

Fertiliser toxicity is governed by two distinct factors:

1. Salt Index – excessive concentrations of fertiliser salts placed in contact with germinating seedlings create an imbalance of ions. When the concentration of ions is greater in the soil than in the plant, the salt moves from the plant tissue to the soil. This leads to the desiccation

of the plant tissue, resulting in seedling injury or mortality. Salt index compares the salt concentration that is induced by fertiliser in solution in comparison to sodium nitrate. The current salt indexes for MAP and DAP are 30 and 35.

2. Ammonia Toxicity – Nitrogen fertilisers that contain ammonium nitrogen have the potential to liberate ammonia when applied to a soil either in a band or broadcast. Ammonia can move freely within the soil solution and move into plant cells, resulting in total desiccation of plant tissue. Ammonia damage is exacerbated by the concentration of ammonium in a different fertiliser material, increasing pH and the solubility of the fertiliser material.

Typically, fertiliser toxicity is increased as row space widens, increasing the amount of fertiliser distributed in the seed row. Crop type and soil type are also important considerations, as crops vary in their tolerance to fertiliser toxicity. Canola is the most susceptible crop while light textured soils are likely to induce more damage than heavy textured soils.

SAFETY DIRECTIONS

Refer to the Safety Data Sheet (SDS) for more detailed safety advice. Before use, read the Product Label and the SDS. Use safe work practices and avoid contact with the eyes and skin. Avoid ingestion and inhaling dust. Protective clothing, eyewear and dust masks should always be used when dealing with this product. Observe good personal hygiene, including washing hands after use. Avoid loss of fertiliser to waterways.

WARNING

This document contains information of a general nature. Before using fertiliser seek independent agronomic advice. Fertiliser programs may need to be varied depending on the plants being grown, climatic and soil conditions, application methods, irrigation, agricultural and livestock management practices, the soil's fertility, and cultural practices. ('Unforeseen Elements')

Fertiliser may burn and/or damage crop roots or foliage. Foliar burn to the leaves, fruit or other plant parts is most likely to occur when fertilisers are foliar applied at high concentrations and/or on a regular basis, different products are mixed and sprayed together at cumulatively high rates, the water is of poor quality, or the spray is applied under hot dry conditions, e.g. in the heat of the day.

Fertiliser and supplements may affect animal health. Seek independent advice before using any supplements in livestock rations.

DISCLAIMER

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