

## Monoammonium Phosphate (MAP)

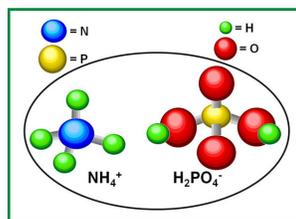
*Monoammonium phosphate (MAP) is a widely used source of P and N. It is made of two constituents common in the fertilizer industry and has the highest P content of any common solid fertilizer.*

### Production

The process for manufacturing MAP is relatively simple. In a common method, a one to one ratio of ammonia ( $\text{NH}_3$ ) and phosphoric acid ( $\text{H}_3\text{PO}_4$ ) is reacted and the resulting slurry of MAP is solidified in a granulator. The second method is to introduce the two starting materials in a pipe-cross reactor where the reaction generates heat to evaporate water and solidify MAP. Variations of these methods are also in use for MAP production. An advantage of producing MAP is that lower quality  $\text{H}_3\text{PO}_4$  can be used compared with other P fertilizers that often require a more pure grade of acid. The  $\text{P}_2\text{O}_5$  equivalent content of MAP varies from 48 to 61%, depending on the amount of impurity in the acid. The most common fertilizer composition is 11-52-0.

### Chemical Properties

Chemical formula:	$\text{NH}_4\text{H}_2\text{PO}_4$
$\text{P}_2\text{O}_5$ range:	48 to 61%
N range:	10 to 12%
Water solubility (20°)	370 g/L
Solution pH	4 to 4.5



### Agricultural Use

MAP has been an important granular fertilizer for many years. It is water soluble and dissolves rapidly in soil if adequate moisture is present. Upon dissolution, the two basic components of the fertilizer separate again to release  $\text{NH}_4^+$  and  $\text{H}_2\text{PO}_4^-$ . Both of these nutrients are important to sustain healthy plant growth. The pH of the solution surrounding the granule is moderately acidic, making MAP an especially desirable fertilizer in neutral and high pH soils. Agronomic studies show that there is no significant difference in P nutrition from various commercial P fertilizers under most conditions.

Granular MAP is applied in concentrated bands beneath the soil surface in proximity of growing roots or in surface bands. It is also commonly applied by spreading across the field and mixing into the surface soil with tillage. In powdered form, it is an important component of suspension fertilizers. When MAP is made with especially pure  $\text{H}_3\text{PO}_4$ , it readily dissolves into a clear solution that can be used as a foliar spray or added to irrigation water. The  $\text{P}_2\text{O}_5$  equivalent content of high-purity MAP is usually 61%.

### Management Practices

There are no special precautions associated with the use of MAP. The slight acidity associated with this fertilizer reduces the potential for  $\text{NH}_3$  loss to the air. MAP can be placed in close proximity to germinating seeds without concern for  $\text{NH}_3$  damage. When MAP is used as a foliar spray or added to irrigation water, it should not be mixed with calcium or magnesium fertilizers. MAP has good storage and handling properties. Some of the chemical impurities (such as iron and aluminum) naturally serve as a conditioner to prevent caking. Highly pure MAP may have a conditioner added or may require special handling to prevent clumping and caking. As with all P fertilizers, appropriate management practices should be used to minimize any nutrient loss to surface or drainage water.

A high purity source of MAP is used as a feed ingredient for animals. The  $\text{NH}_4^+$  is synthesized into protein and the  $\text{H}_2\text{PO}_4^-$  is used in a variety of metabolic functions in animals.

### Non Agricultural Uses

MAP is used in dry chemical fire extinguishers commonly found in offices, schools, and homes. The extinguisher spray disperses finely powdered MAP, which coats the fuel and rapidly smothers the flame.

Abbreviations and notes: N = nitrogen; P = phosphorus;  $\text{NH}_4^+$  = ammonium;  $\text{H}_2\text{PO}_4^-$  = phosphate. MAP is also known as ammonium phosphate monobasic, ammonium dihydrogen phosphate

