Xpyro Ltd
White paper to compare typical long-term fire prevention substances

Chemical composition and their breakdown in soil

Magnesium Chloride	$MgCl_2$	Dissociates into Mg^{2+} and $2Cl^-$ ions quickly; highly soluble.
Magnesium Sulfate	$MgSO_4$	Dissociates into Mg^{2+} and SO_4^{2-} ions; also highly soluble.
Ammonium Polyphosphate	APP	$(NH_4PO_3)n$ Hydrolyzes over time into ammonium (NH_4^+) and orthophosphate ($H_2PO_4^-$, HPO_4^{2-}); breakdown rate depends on microbial activity and pH.

Primary purpose in soil use

$MgCl_2$	Magnesium + Chloride	De-icing agent (not a typical fertilizer); sometimes for Mg supplementation in Mg-deficient soils.
$MgSO_4$	Magnesium + Sulfate	Common Mg fertilizer (e.g. "Epsom salt"); sulfate helps with sulfur-deficient soils.
APP	Nitrogen + Phosphorus	Phosphorus-rich fertilizer; starter fertilizer or in fertigation systems.

Biosafety and environmental impact

$MgCl_2$	Not ideal long-term; chloride ion is mobile and contributes to salinization. Potential toxicity to plants at high doses.
$MgSO_4$	Generally safe; sulfur is essential for amino acid synthesis and not usually harmful. Minimal environmental risk.
APP	Moderate risk if overapplied (eutrophication of water bodies). Safe if applied correctly. Breaks down biologically over time.

Comparison on environmental benefits and risks

Comp.	Pros	Cons
$MgCl_2$	Supplies Mg quickly High solubility; immediate availability.	Chloride can accumulate and become toxic to plants Can increase soil salinity, osmotic stress and ion toxicity.
$MgSO_4$	Dual nutrient source (Mg and S) Neutral pH; safe for most soils.	Less persistent in sandy soils due to leaching May not be sufficient alone as a full fertilizer.
APP	High P availability Good for early plant growth Controlled-release potential depending on chain length.	Can cause P fixation in alkaline soils Overuse may lead to eutrophication Relies on microbial activity to release nutrients.

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Summary of comparison

Property / Use	**$MgCl_2$**	**$MgSO_4$**	**APP**
Key nutrients	Mg, Cl	Mg, S	N, P
Soil pH impact	Acidifying (Cl^- effect)	Neutral	Slightly acidifying
Solubility	Very high	High	Moderate (depends on polymer length)
Fertilizer use	Rare	Common (Epsom salt)	Very common (starter fertilizer)
Toxicity/salinity risk	High (due to Cl^-)	Low	Moderate (P runoff risk)
Bioremediation potential	Low	Medium	High (microbial stimulation)