Summary Table: *Adjuvants for Organic Pest and Disease Management* by P. Merscher & A. Stone (published on eOrganic)

Adjuvant Type	Source	Description	Notes	Common Label Ingredients	Water Modifier	Deposition Aid/Sticker	Drift Control	Penetrant	Spreader/ Wetter	Chemical Precipitation Preventer	Anti/ Defoamer	Weather/ UV protection	Other
Nonionic Surfactants	Variable, incl. plants, microbes, and some approved synthetics	Contain hydrophilic head and hydrophobic tail; form micelles in water; reduces surface tension	The most common in agriculture (incl. organic); often fatty acids, alcohol, glycerin/ol; mode of penetration activity not well understood	Sorbitol, glycerol, alkyl amine ethoxylate, alkylphenol ethoxylate, Polyoxyethelene sorbitan fatty acid ester, polyethylene glycol monododecyl ether, Ethoxylated acetylenic surfactant, alcohols		X		X	X				
Organosilicon Surfactant	Synthesized from natural silica-containing material (quartz, sand, feldspar, kaolinite)	Nonionic; contain hydrophilic head and hydrophobic tail w/ O-Si backbone; form micelles in water; reduces surface tension; interrupt foam lamella	Do not use above 90°F; known for superspreading which helps stomatal entry of spray	Trisiloxane alkoxylate, polyalkyleneoxide modified polydimethylsiloxane, Polyalkyleneoxide, Polyether siloxane (silicone glycol), methylated silicones		X		X	X		X	X	
Saponins (Biosurfactant)	Plants (ex. Yucca, quinoa, soapbark, tea seed)	Contain hydrophilic head and hydrophobic tail; form micelles in water; reduces surface tension	Known for foaming; often somewhat variable in composition which can make less predictable; used as soil drench, surfactant, biocontrol; watch for incompatibility	Soaps, Yucca plant extract, soapbark, saponins		X		X	X				
Rhamnolipids (Biosurfactant)	Bacteria (*Pseudomonas aeruginosa*)	Contain hydrophilic head and hydrophobic tail; form micelles in water (low concentrations); reduces surface tension	New for agricultural applications; may also work as antigen and induce plant defense responses	Rhamnolipids		X		X	X				
Mannosylerythritol lipids (MELs) (Biosurfactant)	Yeast and fungi (*Pseudozyma* sp. & *Ustilago* sp.)	Contain hydrophilic head and hydrophobic tail; form micelles in water (low concentrations); reduces surface tension	New for agricultural applications; may also work as antigen and induce plant defense responses	Mannosylerythritol lipids		X		X	X				
Curcurbitacins	Plants (*Curcurbitaceae* members)	Naturally occur as glycosides activated by herbivory; bitter to herbivores; feeding stimulants for insect species	Designed to cause compulsive eating behavior of pests making them ingest more pesticide in spray	Curcurbitacins from buffalo root gourd									X
Oils/Lipids	Variable, incl. plants (soy, sunflower) and animals (fish)	Fatty acids bound to backbone (glycerol); interact with other hydrophobic materials; can modify plant cuticle solubility to penetrate; increase mixture viscosity	Used as biocontrol and adjuvant; require emulsifier; phytotoxicity common esp. with high temps; watch for incompatability; variable in composition and structure	Glycerides, petrolatum, mineral oil, methyl soyate, emulsifiable vegetable (soy) oil concentrate, karanja oil, vegetable extracts		X	X	X			X	X	
Chelating Agents	Plants and microbes (amino acids), soil and peat (humic acid)	Bind (encapsulate) metal ions to prevent precipitation and leaching	Chelated nutrient can persist in soil and on leaves for longer; pH affects solubility	Clinoptilolite and mordenite (zeolites), bentonite	X	X				X		X	
Acidifiers, Buffers	Usually citric acid (or derivative)	Lower pH of water (acidifier) and stabilize pH (buffer) of solution	Most pesticide, nutrient sprays best in acidic conditions (pH 4.5-6.5); frequently test pH and water hardness throughout mixing and application	β-hydroxytricarballylic acid, citric acid (mono hydrate), 2-Hydroxy-1,2,3-Propanetricarboxylic Acid, Phosphoric acid	X					X			
Polymers	Variable, pinene derivatives, also some siloxanes	Coalesce and form film to protect spray drop from evaporation, rain, etc.; increase mixture viscosity	Function related to concentration in mixture; possible phytotoxicity in hot weather	Polyoxyethylene sorbitan monolaurate, Pinolene, pinene (triterpene) polymers, proprietary blend, Polyalkyleneoxide		X	X		X		X	X	
Water softeners	Variable, can involve salts, filters, and/or magnets	Neutralize mineral ions in hard water (Ca, Mg)	Frequently test pH and water hardness throughout mixing and application	For organic: filter or magnetic system recommended. Salts (ammonium nitrate) are approved for water conditioning in organic but not if applied to field/crops	X								
Humic, Fulvic Acid	Soils, peats, shale (broken down organic material)	Act as chelating agent to encapsulate micronutrients; hygroscopic humectant properties	pH affects solubility; important to prevent soil, water buildup of insoluble compounds	Humic acid, leonardite, fulvic acid		X			X	X		X	
Amino Acids	Plants (soy), and other natural materials	Act as chelating agent to encapsulate micronutrients; moderate surfactant properties	Usable in broad conditions; amino acid chelates can saturate inside plants, so even though available, plants won't take up	Glycine, Metal-Amino acid complexes, *EDTA chelates prohibited by NOP		X		X	X	X			

IMPORTANT: Before using **any pest control product in your organic farming system:

1. read the label to be sure that the product is labeled for the crop and pest you intend to control, and make sure it is legal to use in the state, county, or other location where it will be applied,
2. read and understand the safety precautions and application restrictions, and
3. make sure that the brand name product is listed in your Organic System Plan and approved by your USDA-approved certifier. If you are trying to deal with an unanticipated pest problem, get approval from your certifier **before** using a product that is not listed in your plan—doing otherwise may put your certification at risk.

Note that, although OMRI and WSDA lists are good places to identify potentially useful products, all products that you use must be approved by your certifier. For more information on how to determine whether a pest control product can be used on your farm, see the eOrganic article Can I Use This Input On My Organic Farm?