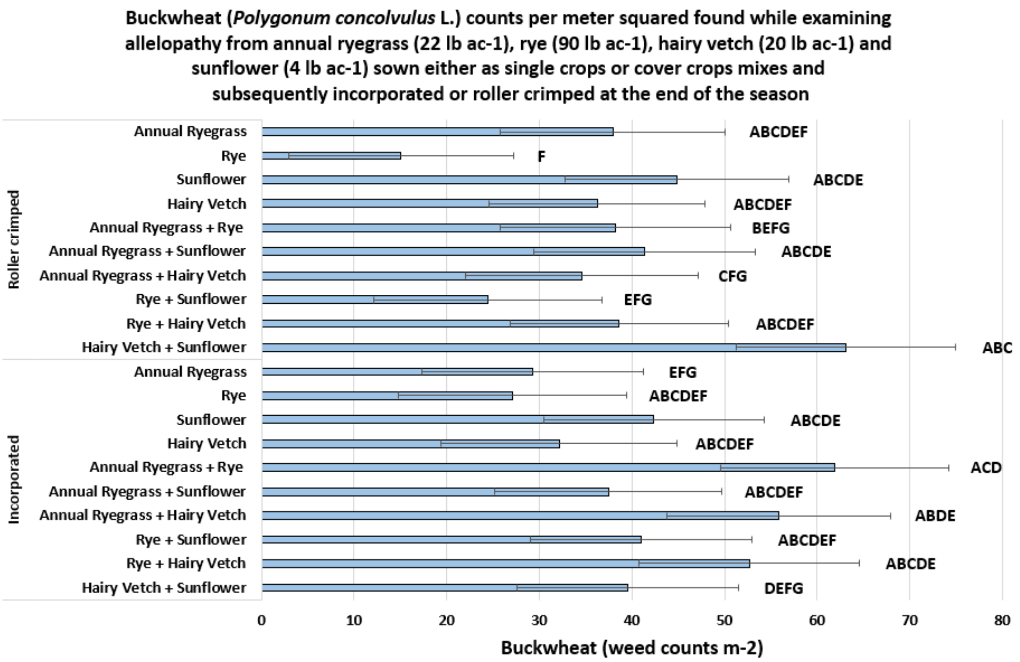
ASSESSING THE ALLELOPATHIC EFFECTS OF COVER CROPS ON A CROP ROTATION

Allelopathy is the influence, usually detrimental, of one plant on another, where toxic substances are released when a plant dies or produced through decaying tissue. These secondary metabolites may establish direct or indirect impacts on populations of their own or different species. Allelopathy can a) affect the growth and yield of another crop (Batish et al. 2001) or b) develop autotoxicity, meaning chemicals expelled from plant residues of a species can hinder the growth of seedlings of the same species.



Many of the cover crops seeded to protect the ground have allelopathic properties. Crops such as rye (Secale cereale L.), annual ryegrass (Lolium multiflorum L.), hairy vetch (Vicia villosa L.) and sunflower (Helianthus annuus L) have been shown to limit or reduce the growth of other plant species. Therefore, residues of these cover crops not only provide benefits to the soil but also help to reduce weed populations through allelopathy for the cash crops seeded in the season thereafter. In this experiment weeds were surveyed every two weeks after cover crop mix seeding to observe if allelopathic effects changed according to cover crop species or cover crop mixes. At the end of the season, plots were either roller-crimped or incorporated. The following growing season, canola, field pea and wheat will be sown perpendicular to the direction of these plots to observe if weed populations are still suppressed by the allelopathic effects of the cover crops and their mixes. Further, it will be assessed whether roller-crimping and incorporation impact weed suppression along with allelopathy.

Weeds such as buckwheat (Polygonum convolvulus L.), foxtail barley (Hordeoum jubatum L.), plantain weed (Plantago major L.), dandelion (Taraxacum officinale Weber), horsetail (Equisetum arvense L.), Canada thistle (Cisium arvense L. Scop.), narrowleaf hawkweed (Crepis tectorum L.), redroot pigweed (Amaranthus retroflexus L.), lamb's quarters (Chenopodium album L.), yarrow weed (Nestia particulata L. Desv.), cinquefoil (Potentilla norvegica L.), hemp neetle (Galeopsis tetrahit L.), stinkweed (Thlapsi arvense L.), barnyard grass (Echinochloa crusgalli L. Beauv.), pepper grass (Lepidium densiflorum Schrad.), alsike clover (Trifolium hybridum L.), pineapple weed (Matricaria matricarioides Less Porter), common groundsel (Senecio vulgaris L.), and shepherd's purse (Capsella bursa-pastoris L. Medic) were identified. While most of the weeds had sporadic appearances in quadrats surveyed at each plot, weeds that prevailed and were greater in number per quadrat over a monitoring period of 12 weeks were buckwheat, stinkweed, and dandelion.. Buckwheat individuals were at the lowest population in plots sown with rye (Secale cereale L.), whereas buckwheat populations thrived in cover crop mixes sown with hairy vetch and sunflower.

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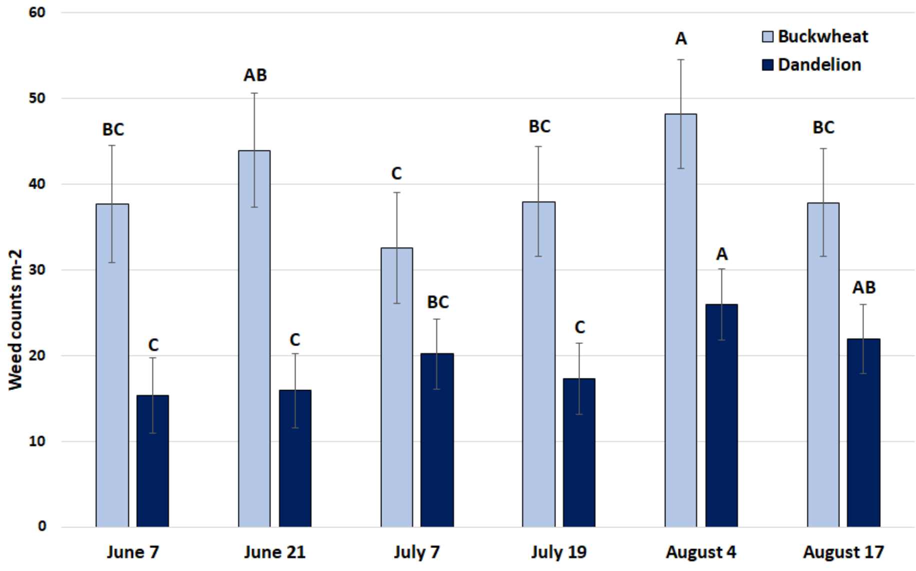
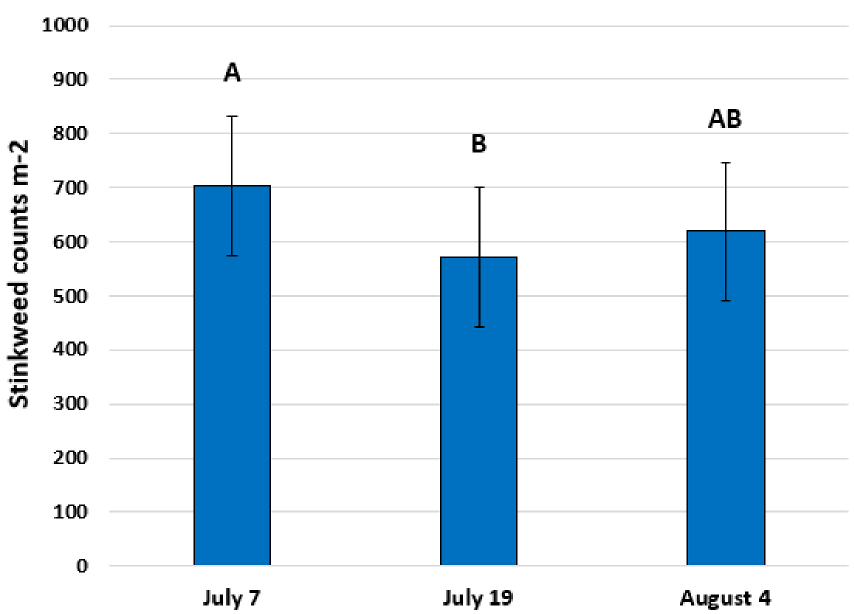
Buckwheat (Polygonum convolvulus L.) and dandelion (*Taxaracum officinale* Weber) counts per meter squared found bi-weekly while examining allelopathy from annual ryegrass (22 lb ac-1), rye (90 lb ac-1), hairy vetch (20 lb ac-1) and sunflower (4 lb ac-1)



Stinkweed (*Thlapsi arvense* L.) counts per meter squared found bi-weekly while examining allelopathy from annual ryegrass (22 lb ac-1), rye (90 lb ac-1), hairy vetch (20 lb ac-1) and sunflower (4 lb ac-1) sown either as single cover crops or cover crops mixes



Number of weeks post cover crop and cover crop mix seeding impacted buckwheat population (P=0.0288). Buckwheat counts were lowest at six weeks after peaking at four weeks post-seeding. Stinkweed and dandelion number of individuals were different over the course of time. Stinkweed stands were greater six weeks after cover crop and cover crop mix seeding with a significant drop two weeks after. Dandelion individual numbers were at their highest ten weeks after cover crop and cover crop mix seeding whereas the lowest numbers recorded were two, four and eight weeks after seeding. It is possible that stinkweed peaked six weeks after cover crop and cover crop mix seeding because it was able to thrive in the heat and drought stress that weeds such as buckwheat and dandelion were unable to tolerate. Tolerance was likely achieved which explains the increase in numbers ten weeks after seeding. Come the last week of measurements, buckwheat and dandelion populations did not decrease, nor did stinkweed populations which remained statistically the same as reported six weeks after cover crop and cover crop mix seeding.

Overall, results obtained this season showed that there is no difference in cover crop allelopathy either sown as a single species or as a mixture with others. These impacts, however, may be different in plots roller crimped and incorporated and possibly influenced by the main crops in present weed populations.