2021 CWSS-SCM Virtual AGM (November 23, 2021) -

Abstracts

Title: Agricultural intensification and climate change have increased the threat from weeds.
Presenter: Dr. Jonathan Storkey
Abstract: Research culture is currently largely based on hypothesis driven science. To win a grant, our hypotheses need to be clearly defined and experiments designed to deliver time constrained milestones and deliverables that prove or disprove the hypotheses with success largely being determined by the number of papers published in prestigious journals at the end of the grant. 'Observational studies' are generally seen as the poorer scientific relation as they are open ended and the assumption is we don't know what we are looking for. Examples include large scale vegetation surveys or long term experiments which can be challenging to find funding for. However, I will present examples from Rothamsted's famous Long Term Experiments (the oldest of which, Broadbalk, is 178 years old!) that demonstrate when we humbly approach natural systems with an open mind, collecting data in a systematic, robust way over long time periods, new insights can emerge that we would not have gained through conventional short term experimentation. I will also explore the motivation for doing science from the perspective of the founders of the Rothamsted Experiments whose focus was on addressing real world problems rather than making science an end in itself.

Title: Fungicide seed treatment influences on constant final yield achievement in soybean (*Glycine max* L.)
Presenter: Alexander Beaton
Abstract: Constant final yield (CFY) describes the observation that a wide range of plant densities result in similar biomass production per unit area. Optimal plant density of field crops such as soybean occurs as soon as constant final yield is reached as further increases in seeding rate have negligible effects on yield. Further reductions in seeding rate could be achieved through management factors such as the use of seed treatments which protect seedlings from early disease pressure, maximize emergence and offer physiological benefits. To investigate this possibility, we assessed several fungicide seed treatments across a range of soybean planting densities in a field trial in Prince Edward Island. We evaluated an untreated control against the use of four fungicide seed treatments (fludioxonil, metalaxyl-M, sedaxane, metalaxyl-M+sedaxane+fludioxonil) across four soybean planting densities, 247 000, 494 000, 741 000, 1 480 000 seeds ha^{-1}. Seed treatment did not increase emergence at any density evaluated. Further, seed treatment did not impact the decline in yield $plant^{-1}$ nor harvest index as plant density increased. Yield (kg ha^{-1}) increased to 494 000 seeds ha^{-1}. After which further increases in plant density did not lead to greater yield, suggesting CFY of soybean had been achieved. Treatment with metalaxyl-M and sedaxane, however, increased yield (kg ha^{-1}) at the lowest planting density achieving yields similar to all densities evaluated. These results demonstrate that CFY of soybean can be altered through the use of seed treatments demonstrating a possible mechanism to reduce seed inputs.

Title: Experiences with Commercial Management of Japanese Knotweed in Nova Scotia
Presenter: Tyler Jollimore

Abstract: Japanese knotweed (Fallopia japonica) is a physically challenging weed species to manage due to its size (2.5 – 3 m in height), the large areas can occupy, and the difficulty in estimating the cost of management due to the lack of literature on small scale management efforts. Therefore, several case studies were undertaken from 2018 thru 2021 to evaluate the cost, difficulty, and efficacy budgeted management plans. Advertising was conducted on Facebook and Instagram to seek out clients interested in management of knotweed on their personal property. Of the 36 cases taken on, two cases that began in 2018 (Disbrowe and Finnigan) were selected for discussion. Management consisted of cutting at peak height to gain access to the canopy and to

scout for hazards. Spot applications of Roundup Concentrate (domestic – 7 g a.e. L-1 H2O) were applied to standing knotweed canopy at peak height and regrowth in the fall. Follow up treatments were conducted to treat any knotweed regrowth in the following growing season(s). After two seasons of herbicide applications, knotweed was scantly visible, line of site through the affected areas was improved, and clients indicated they were satisfied with the outcome. The total of invoices for each client did not exceed 25% of the estimated cost (~ $750 per project), or $1.70 CAD m-1 of knotweed. While this model can successfully cover costs and achieve desired outcomes. Additional modifications may be required for scaling of these strategies for widespread efforts and to ensure long term financial stability.

Title: Development of Phenological Models and Management Strategies for Narrow leaf Goldenrod (*Euthamia graminifolia* L.) in Lowbush Blueberry (*Vaccinium angustifolium* Ait) Fields.
Presenter: Lienna Hoeg
Abstract: Lienna's project will focus on narrow leaf goldenrod (*Euthamia graminifolia* L.), which is a creeping herbaceous perennial found in lowbush blueberry fields (Hall, 1959; McCully et al. 1991; Lyu et al. *in press*). In the mid-1980's a weed survey of lowbush blueberry fields across Nova Scotia found that goldenrod species were present in 40% of the 115 fields surveyed (McCully et al., 1991). In more recent years, another weed survey indicated the occurrence of narrow leaf goldenrod in more than 80% of fields surveyed and reduced occurrence of other goldenrod species (Lyu et al. *in press*). Farooq (2018) concluded that sequential herbicide treatments of mesotrione applied post-emergence at 14, 21, and 28 days apart provided adequate control of narrow leaf goldenrod. This treatment, however, remains unregistered for use in lowbush blueberry. In addition, there is limited knowledge of the general phenology and emergence patterns exhibited by narrow leaf goldenrod in lowbush blueberry fields, and little knowledge of the seed bank dynamics or extent and occurrence of seedling recruitment of this weed species in lowbush blueberry fields. Further research is needed to identify alternative herbicide applications and investigate the phenology and seed dynamics of narrow leaf goldenrod. The overall objectives of this study are to explore alternative management strategies for narrow leaf goldenrod and to develop predictive models for narrow leaf goldenrod phenological development.

Title: Investigation of management practices to optimize cover crop-based weed mitigation in Canadian sweet corn production.
Presenter: Hayley Brackenridge
Abstract: Fall sown cereal rye (*Secale cereal* L.) has gained popularity as a cover crop in vegetable production due to its weed-suppressive capabilities. When mechanically terminated with a roller-crimper, this method of weed control makes an inexpensive enhancement to an integrated weed management program. Research has shown that replacing pre- and post-emergent herbicide applications with roller crimped cereal rye has variable success at controlling weeds and maintaining vegetable cash crop yield. Therefore, the objective of this research was to test roller crimped cereal rye in sweet corn production to determine whether it can provide season-long weed control and maintain yield without additional weed control measures. Two cereal rye cultivars (early vs. standard maturity) were compared at three seeding rates (150, 300, and 600 seeds m^{-2}) with and without post-emergent herbicide application for their effect on weed control and sweet corn yield. The trial was conducted at Agassiz, BC, Harrow, ON, and St. Jean-sur-Richelieu, QC in 2019 and 2021 and at Harrow and St. Jean-sur-Richelieu in 2020. Results suggest that weed control by roller crimped rye peaks between crimping and eight weeks after crimping and is higher in rye sown at 300 and 600 seeds m^{-2} than 150 seeds m^{-2}. Sweet corn yield in roller crimped cereal rye with post-emergent herbicides was equal to the weed-free no rye control, however, without post-emergent herbicides, significant yield loss occurred. This suggests that cereal rye must be sown at

least 300 seeds m^{-2} to maximize weed control, but post-emergent herbicides are still required to control late season weeds and maintain sweet corn yield. These findings support the use of roller crimped cereal rye in an integrated weed management program for sweet corn production in combination with additional late season weed control measures.

Title: Seed choice in carabids is driven by the interplay between seed volatiles and lipid content
Presenter: Khaldoun Ali
Abstract: Carabid (ground) beetles are among the widely distributed groups of predatory insects in temperate arable lands. Carabid predators of numerous species are omnivorous and prey upon a wide range of pests and weed seeds. Carabids usually attack weed seeds after seed shed, and seed removal rates can reach upwards of 65-90% for certain seed species. Despite this, some core aspects of seed feeding ecology remain poorly understood for omnivorous carabids. It remains unclear why omnivorous carabid predators choose to include seed species in their diets when alternative foods are accessible, or why carabids prefer to consume seeds of certain species when seeds of different species are available. It is therefore essential to study the biology and ecology of seed preference in omnivorous carabids to better understand their potential as weed biocontrol agents in agro-ecosystems. Here, we show that carabids rely on olfactory perception of long-chain volatile chemicals derived from epicuticular lipids located on the seed coat surface to identify the seed species suitable for consumption. Seed volatiles seem to encode information about the lipid content of seed species. Testing this assumption via synthetic diets has revealed that fatty acids are generally more limiting than protein (amino acids) to nutrient foraging in carabids. Carabids as such seem to seek seed consumption to acquire essential lipids that are often scarce in prey items. Factors that reduce the quality of protein in the seed can restrain carabids from obtaining seed lipids, and thus may somewhat protect the seed against carabid predation. Seed chemistry can predict seed selection decisions in carabids only if the physical traits of seed species vary within certain limits, however. It could be concluded that, within certain limits of seed physical characteristics, lipid-rich seeds are more likely to incur intense carabid attacks in the field.