stored soil moisture in fallow, impacting the subsequent crop. Glyphosate has been a reliable control option for the weed, but resistance to glyphosate has now been confirmed in populations growing in the northern cropping region of Australia. To determine how widespread this problem is in the northern cropping region, a survey commenced in 2014 and will conclude in 2016. Common sowthistle seeds have been collected from cropping properties in the region, as part of a non-targeted sampling approach. Plants were grown to a two to four leaf stage, and then treated with a commercial glyphosate formulation at various rates, to determine the discriminating dose that distinguishes between resistant and susceptible populations. Following determination of this rate, screening tests were performed using field collected seed obtained from cropping properties throughout the region. Close to 20% of the populations tested have exhibited resistance to glyphosate (i.e. less than 80% of seedlings were killed by treatment with glyphosate at the discriminating dose). Preliminary results indicate that glyphosate resistant populations are clustered in one location within the region, where long term use of conservation tillage practices has resulted in reliance on glyphosate for sowthistle control. By determining the geographic extent of glyphosate resistant common sowthistle in the northern region, the results of this survey will assist industry stakeholders to respond with suitable management solutions for the control of this problematic weed.

OPTIMIZATION OF INTER-ROW SPACING AND NITROGEN RATE FOR THE APPLICATION OF VISION GUIDED INTER-ROW WEEDING IN ORGANIC SPRING CEREALS. B. Melander*[1], O. Green[2], L. Znova[2]; [1]Aarhus University, Research Center Flakkebjerg, Slagelse, Denmark, [2]Agro Intelligence, Aarhus, Denmark (461)

**ABSTRACT**

Optimization of Inter-Row Spacing and Nitrogen Rate for the Application of Vision Guided Inter-Row Weeding in Organic Spring Cereals. B. Melander*[1], O. Green[2] & L. Znova[2]., [1]Aarhus University, Slagelse, Denmark, [2]Agro Intelligence, Aarhus, Denmark

Flex-tine weed harrowing conducted as a full-width operation treating both crop and weeds is the principal method for direct weed control in organic spring cereals in Northern Europe. Results with this technology have varied considerably where especially crop injuries and control failures against tall-growing and tap-rooted weed species have been major drawbacks. New camera technology capable of detecting crop rows makes it possible to employ selective weed control in spring cereals. Normally cereals are grown at 12.5 cm row spacing in Northern Europe but even a moderate extension of the row spacing can make enough room for implementing automatically steered inter-row hoeing. Experiences from practice have shown that camera-based steering systems can guide a hoe blade accurately in a 20-25 cm wide inter-row space. The steering systems have also improved work rates by increasing implement width and forward speeds and the technology is gradually being employed on an increasing number of organic farms. Growers claim that crop injuries are negligible and weeding effectiveness against problematic weed species has improved compared with weed harrowing. However, the cereal cropping system has not been optimized to the usage of inter-row cultivation. Intra-row weeds, i.e. those growing in the crop lines, are not controlled and increasing the row spacing to 25 cm or more may cause a yield penalty. The aim of this study was to investigate the interaction between inter-row cultivation, inter-row spacing and nitrogen rate on weed and crop growth. Results are reported from two years field experiments with spring barley and spring wheat. It was aimed to maintain a constant seed rate for all five row spacing studied (12.5, 15, 20, 25 and 30 cm), which gave a higher crop density in the rows with increasing row spacing. A denser intra-row crop stand would improve the suppression of surviving intra-row weeds and partly compensate for the more weed growth that wider row spacing would cause by allowing more light penetration into the crop canopy. It was found that maintaining the seed rate when increasing row spacing was important for preserving crop yields. The best results in terms of weeding effectiveness and crop yield were achieved with 15 and 20 cm row spacing and high N rate; most evident in spring barley. It was seen that the traditional ‘Ducksfoot’ blade is not an optimal solution for inter-row cultivation at small row spacing. As a consequence, a new blade has been developed which is also presented at the WSSA 2016 Annual Meeting.

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COMBINING PRE-EMERGENT HERBICIDES AND CROP COMPETITION TO CONTROL HERBICIDE RESISTANT WEEDS IN AUSTRALIA. C. Preston*[1], S. G. Kleemann[2], G. S. Gill[2]; [1]University of Adelaide, Glen Osmond, Australia, [2]University of Adelaide, Adelaide, Australia (462)

**ABSTRACT**

Canola (*Brassica napus*) is the third most important grain crop in Australia with 2.3 million ha sown in 2015. Canola is widely employed as a break crop between cereal crops to aid control of cereal root diseases and grass weeds, specifically rigid ryegrass (*Lolium rigidum*). Rigid ryegrass is the most important weed of crops in Australia, is present over most of the winter grain production area and has evolved resistance to all of the in-crop post-emergence herbicides registered for its control. Clethodim was often the last post-emergent product available for the control of herbicide resistant rigid ryegrass and was widely employed in canola crops to help reduce rigid ryegrass populations. Increasing resistance to clethodim in rigid ryegrass means pre-emergent herbicides are becoming the main tool to manage rigid ryegrass in canola. Field trials conducted in 2013 and 2014 in South Australia to examine the efficacy of pre-emergent herbicides on control in open-pollinated triazine-tolerant canola (TT canola) and hybrid imidazolinone-tolerant canola (Clearfield canola) showed varying efficacy of dimethenamid-P, propyzamide and pethoxamid for control of rigid ryegrass. Propyzamide was the most effective of the three herbicides in each year at controlling rigid ryegrass establishment in both types of canola. There was no difference in weed establishment between canola types; however, rigid ryegrass spike number was reduced by 50% or more where the Clearfield canola was grown compared to the less competitive TT canola. This demonstrates that competitiveness of canola can have a major impact on reducing rigid ryegrass seed production when coupled with pre-emergent herbicides as part of an integrated approach to managing clethodim-resistant rigid ryegrass.

INTEGRATED WEED MANAGEMENT IN WINTER WHEAT AND ROW CROPS - AN UPDATE ON RECENT RESEARCH ACTIVITIES IN DENMARK. P. Kudsk*[1], B. Melander[2], S. K. Mathiassen[1], N. Holst[1]; [1]Aarhus University, Slagelse, Denmark, [2]Aarhus University, Research Center Flakkebjerg, Slagelse, Denmark (463)

**ABSTRACT**

INTEGRATED MANAGEMENT OF *BROMUS TECTORUM* (CHEATGRASS) WITH SHEEP AND HERBICIDE. E. A. Lehnhoff*[1], L. Rew[2], T. Seipel[2], J. Mangold[2], D. Ragen[2]; [1]New Mexico State University, Las Cruces, NM, [2]Montana State University, Bozeman, MT (464)

**ABSTRACT**

Cheatgrass (*Bromus tectorum*) has invaded large areas of rangeland throughout the western USA. Attempted management and restoration techniques have included herbicide, prescribed fire, grazing, biological control and native species seeding, but success is rare as treatments hinder desirable species and cheatgrass returns. Integrating management techniques has the potential for improved management success, but few studies have addressed integration. We are studying the integration of sheep grazing and herbicide for cheatgrass control in Montana, USA. Whole plots (4m × 20m) were either grazed (4 sheep, 24 hours, 5/5/2015) or ungrazed. Herbicide treatments were applied to 4m × 5m split plots in spring and fall. Eight total treatments included: control, grazed, spring (5/1/2015) glyphosate (0.42 kg ai ha$^{-1}$, non-ionic surfactant at 0.1% v/v), fall (10/16/2015) imazapic (0.42 kg ai ha$^{-1}$ Panoramic), spring glyphosate + fall imazapic, grazed + fall glyphosate, grazed +