KRALL, JAMES M., DAVID W. KOCH, FRED A. GRAY, AND JAMES R. GILL, University of Wyoming, Plant Science Department and Cooperative Extension Service, Laramie, WY 82071. **Cultural management of trap crops for sugar beet nematode (*Heterodera schachtii*) control in Wyoming.**

ABSTRACT

Trap crops are a promising alternative to nematicides for control of sugar beet nematode (*SBN*). Trap crops are specially developed varieties of fodder radish (*Raphanus sativa*) and yellow mustard (*Sinapis alba*). There is a need to determine the most effective use of trap crops in Wyoming. The objective was to compare the effect of cultural management practices on production of trap crops.

A series of research/demonstration field trials in randomized designs with three, four or six replications were conducted from 1992 to 1997. Trap crops included 'Pegletta' and 'Adagio' radish and 'Maxi' and 'Metex' mustard. Planting followed cereals (spring barley, spring or winter wheat, or spring oats), corn, or dry beans. Cereal locations were in Wyoming's Big Horn Basin (NW Wyoming). Locations for re-cropping after corn and dry beans were in SE Wyoming. Nitrogen fertilizer input studies followed either the harvest of spring barley, silage corn or dry bean. Ammonium nitrate fertilizer was applied broadcast at planting. Three fertilizer levels of nitrogen were tested: none, low-N (44.8 - 56 kg ha^{-1}) and high-N (double the low-N rate). Means of 7 trials were pooled from the fertilizer and re-cropping studies. In the trap crop after corn silage experiment, main-plots were silage removal on 8/6, 8/21 and 9/4 and sub-plots were broadcast N rates of 0, 44.8, and 89.6 kg ha^{-1}. Maxi' mustard was drilled into each of the sub-plots. In the trap crop broadcast onto standing grain corn experiment, mustard was broadcast at 21, and 42 kg ha^{-1} on 9/4. Mustard density and top-growth production was measured on 10/16. In the trap crop after dry bean experiment, main plots were 'Maxi' mustard broadcast seeded at 21 and 42 kg ha^{-1} and drill seeded at 21 kg ha^{-1}. Broadcast treatments were sown 8/27 before under-cut harvest (knifing) of dry bean. Drill seeding was done on 9/1 after dry bean removal. Sub-plots were 0, 44.8, and 89.6 kg N ha^{-1} surface broadcast before seeding. In the trap crop after malt barley experiment main plots were: (1) stubble planting with disk drill following glyphosate (2338 ml ha^{-1}); (2) disking before disk drill seeding (no herbicide); (3) stubble planting with disk drill (no herbicide). Sub-plots were: Broadcast N at 0, 56 and 112 kg ha^{-1} before seedbed preparation. Production of 'Maxi' and 'Metex' mustard and 'Pegletta' and 'Adagio' radish was compared. Mustard and radish were drill seeded at 19 and 26 kg ha-1, respectively. Trap crop dry matter production following cereals was more than 3 times higher than following corn and dry bean. More growing degree days (GDDs), base 4.4°C, were available following cereals (1450) than following corn and dry beans (620 - 660). Addition of low N increased dry matter production by one third over the unfertilized treatments across 7 trials. Addition of high N did not appreciably increase trap crop dry matter production over the low input (33 vs 37%).

Broadcast N rates of 44.8-56 kg ha^{-1} at planting are recommended for trap crops in Wyoming. Planting date had greater impact on radish growth than N fertilization in the trap crop after corn silage experiment. Trap crop response to N only partially compensated for planting delay (non-fertilized earliest planting date > middle date high fertilizer > non-fertilized middle date). Corn silage fresh weight, dry matter and TDN were reduced by early harvest. Additional economic loss occurred due to the need to reduce ensilage moisture. The high broadcast seeding rate, in

the trap crop broadcast onto standing grain corn experiment, increased plant population over to the lower rate, but did not result in increased top growth. Although the grain corn was approaching maturity negative impacts on trap crop growth from competition were noted. Broadcast planting into dry beans before knifing provided 96 additional GDD's over drilling after harvest. Dry matter accumulation was similar for the two planting methods at comparable seeding rates. The higher broadcast seeding rate resulted in highest plant density and higher dry matter yield. Fertilizer contacting the germinating mustard seed lowered plant density; however, eventual dry matter production tended to increase with additional fertility over the unfertilized treatment. Addition of 56 kg N ha^{-1} in the trap crop after malt barley experiment, increased trap-crop growth in all three seeding/tillage scenarios compared to the unfertilized treatments. An additional 56 kg N ha^{-1} further increased growth in the hebicide/stubble seeded treatment but not in the others. Less radish growth with stubble seeding was due to volunteer barley competition. 'Pegletta' radish and 'Metex' mustard produced the greatest amount of top growth. All radish and mustard varieties displayed very good cold tolerance. Currently, seed of 'Adagio' radish and 'Metex' mustard are available domestically.

Planting date was the most important factor in trap crop growth. In years where the previous crop can be removed and trap crops planted by the last week of August supplemental N application is recommended. Application of N did not make up for the lateness of planting. Early removal of corn silage for trap crops showed promise, but there was a penalty as a result of lower silage dry matter and quality. Broadcast application of trap crop over sprinkler irrigated grain corn resulted in acceptable plant densities, but unacceptably low growth. Broadcast application of trap crop prior to knifing of beans did not compensate for lateness in establishment. Trap crops after full term silage corn and dry beans should be avoided. Re-cropping with 'Adagio' radish or 'Metex' mustard trap crops with N application immediately following cereal harvest is advisable along with the use of herbicide to control volunteer cereal. In southeast Wyoming, corn and dry beans dominate as rotational crops. More research is needed on alternative rotation crops to develop trap cropping in this region.