WHEAT AND LENTIL CROP LOSS AND HARVEST DIFFICULTIES DUE TO WILD TOMATO (Solanum triflorum)

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ABSTRACT

Crop loss studies were conducted in wheat and lentil near Delisle, Laird, and Vonda, Saskatchewan in 1991 and 1992. Wheat yield and biomass were reduced at one of four sites . Lentil yield was reduced at three of six sites, while lentil biomass was reduced at four of six sites. Wild tomato was most competitive when it emerged early and at high density, and when the crop vigour was low. In the fall of 1992, data were collected on the effect of wild tomato on harvestability. Wheat harvestability is not affected by wild tomato. Wild tomato caused soil to adhere to the lentil seed (earth-tag), and increased the moisture content of the lentil sample. Wild tomato berry juice mixed with harvest debris and this mixture plugged the concaves and the augers of the combine. Wild tomato seed is being spread by harvest equipment.

INTRODUCTION

Wild tomato (Solanum triflorum) is a serious weed species in many lentil fields in Saskatchewan. Information is limited on wild tomato control, or how wild tomato competition affects the yield of lentil. Wild tomato is an annual. It is heavily branched, generally decumbent and spreading, with ill-smelling foliage (3). Wild tomato exhibited long seed dormancy in cultivated soil at Swift Current (1). Emergence generally begins in early spring and continues to mid-July (1, 2). Tillage at monthly intervals failed to increase wild tomato germination (2). In general, plant biomass, berry production, and seed production of the nightshades are severely restricted by shading (3). In Saskatchewan, broad leaf herbicides used in lentil are not effective against wild tomato (4). At harvest, the moist foliage and berries mix with lentil seed, soil and other material, and this mixture can clog combine augers, sieves, and concaves. The objectives of this study were to determine yield loss in wheat and lentil due to wild tomato competition, and to determine whether a cereal such as wheat, could be an effective tool to reduce wild tomato seed production. In addition, observations were made to document harvest difficulties caused by the presence of wild tomatoes in lentil and wheat at harvest.

METHODS AND MATERIAL

Crop loss studies were conducted in wheat and lentil near Delisle, Laird, and Vonda, Saskatchewan in 1991 and 1992. The expermintal design was randomized complete block with two treatments in 1991 and three in 1992. In 1991, treatments consisted of a plot free of wild tomato all season, and one in which wild tomatoes were present all season. The treatment blocks

were replicated 10 times over a range of wild tomato densities. In lentil, the plots were 2 square metres, and in wheat they were 1 square metre. Simple t-tests were conducted to determine treatment differences. In 1992, a treatment was added in which the wild tomatoes were removed at mid-season. The treatment blocks were replicated 10 times (for wheat) and 20 times (for lentil), and placed over a range of wild tomato densities. In 1992, the wheat and lentil plots were all 1 square metre in area. Analysis of variance and t-tests were used to determine treatment differences. In 1992, all plots were sprayed with an insecticide to control Colorado potato beetles.

In 1992, wild tomato density was estimated in fifteen lentil crops in areas around Laird and Vonda, Saskatchewan. Wild tomato densities were recorded in 20, one-quater square meter quadrates at harvest. The harvest operation was observed in five of the lentil fields and lentil seed samples obtained.

RESULTS AND DISCUSSION

In 1991, lentil yield and biomass were not reduced due to wild tomato competition (fig. 1. and fig.2.). Despite a high Colorado potato beetle density which caused continual defoliation of wild tomato, the wild tomatoes persisted at relatively high numbers until August. Colorado potato beetles reduced the growth of the wild tomatoes, and prevented wild tomato seed production.

In 1992, a lentil yield loss of 880 kg ha^{-1} occurred at Vonda"A" (fig. 1.). At Vonda"B"and Laird"B", lentil yield was reduced by 180 kg ha^{-1} and 356 kg ha^{-1} respectively. Yield was not reduced at Laird"A". At Vonda"A", lentil yield and biomass increased in plots maintained free of wild tomatoes from the time the lentils began to flower, to lentil maturity. Lentil biomass was reduced at all four lentil sites in 1992 (fig. 2.).

In 1991, wheat yield and biomass were unaffected by wild tomato competition (fig. 3 and fig. 4). The wheat canopy development occurred rapidly and the wild tomato were almost all dead by mid-July. The wild tomato were much more etiolated than the wild tomato plants in lentil. The wheat obtained a height greater than 125 centimetres.

In 1992, wheat yield and biomass were reduced at Vonda (fig. 3 and fig. 4). Wheat yield was reduced by 269 kg ha^{-1} at the Vonda site. Wild tomatoes emerged 1-2 weeks before the crop and ranged in density from 20 to 450 plants per square metre. Removing wild tomato during the early boot stage did not increase wheat yield. At Laird, wheat yield and biomass were not reduced. The wild tomatoes emerged at the same time as the wheat, and the wild tomato densities were approximately half that at Vonda.

When wild tomato berries enter the combine the berries rupture and the berry juice and seeds mix with the dust and debris during the harvest operation. This mixture built up on the combine concave, in the clean grain elevator and on the grain tank auger. Many wild tomato berries reached the grain tank intact. The lentil and wild tomato mixture can form lumps in the grain tank and the berry juice increased the moisture content of the lentil. Some

FIGURE #1 LENTIL SEED YIELD LOSS
(1991 AND 1992)

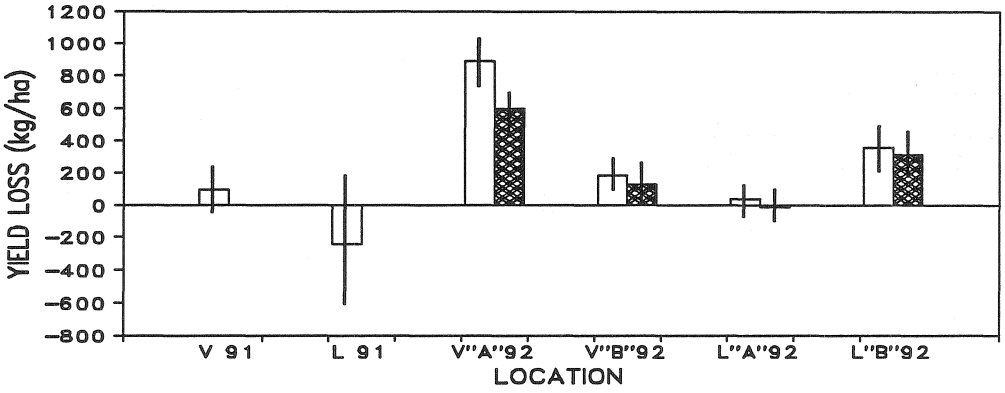
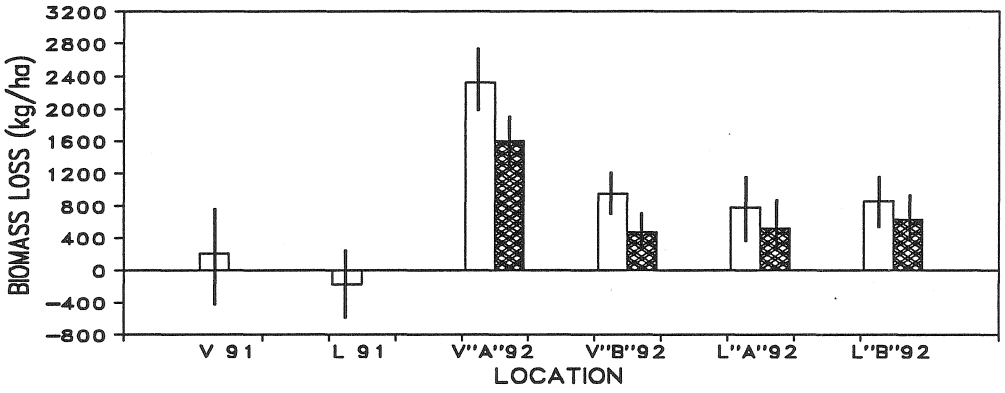


FIGURE #2 LENTIL BIOMASS LOSS
(1991 AND 1992)



LEGEND

NO WILD TOMATO ALL SEASON, MINUS WILD TOMATO PRESENT ALL SEASON

NO WILD TOMATO ALL SEASON, MINUS WILD TOMATO REMOVED AT MID-SEASON

D= Delisle, V= Vonda, L= Laird

FIGURE #3 WHEAT SEED YIELD LOSS
(1991 AND 1992)

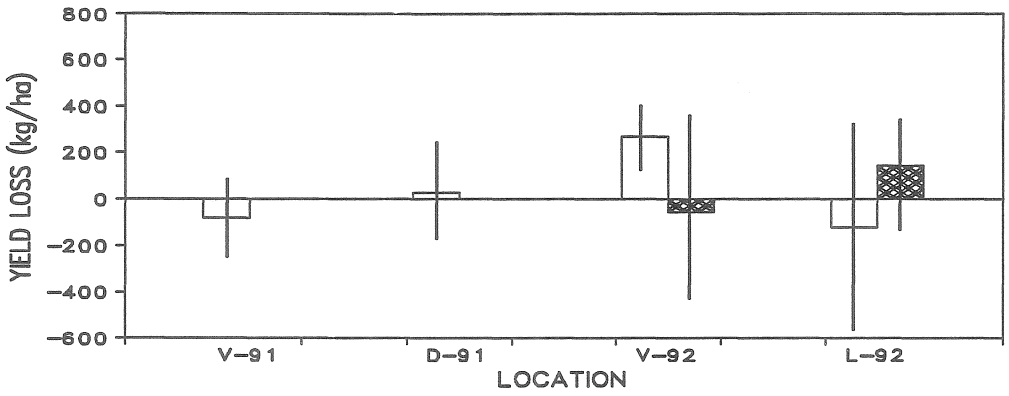
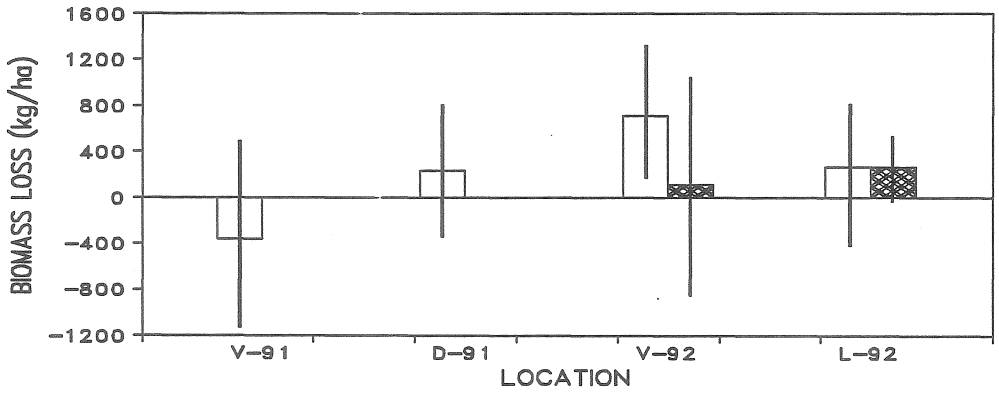


FIGURE #4 WHEAT BIOMASS LOSS
(1991 AND 1992)



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wild tomato seeds became glued to the lentil seeds, and the tires of the combine as it was driven through a patch of wild tomatoes. Some wild tomato berries passed through the combine intact and were thrown great distances. Others berries were smashed and their seeds were spread out the back of the combine.

Without additional information, it is impossible to ascertain the wild tomato density which may lead to harvest difficulties. In the fall of 1992, it appeared that when the wild tomato density was quite high (greater than 50 plants per square meter), the wild tomato plants tended to remain short and few berries entered the combine. At lower densities, the wild tomato plants obtained a height similar to the lentil canopy, and were placed into the lentil swath.

CONCLUSIONS

Lentil yield and biomass loss may depend on the relative time of the crop and wild tomato emergence, the relative density of the crop and wild tomatoes, and the time required for canopy closure. The impact of Colorado potato beetle on reducing yield loss in lentil due to wild tomato, depends on when Colorado potato beetles begin to feed on wild tomatoes. At three of four sites, lentil yield did not increase in plots maintained free of wild tomatoes from the time the lentils began to flower, to lentil maturity.

Wheat yield and biomass loss may depend on the relative time of wild tomato and wheat emergence, density of wild tomato, and the crop vigor. Wheat is an effective tool to decrease wild tomato seed production.

Wild tomato seeds are being spread by mechanical means. Wild tomato patches should be worked and harvested separately, and equipment thoroughly cleaned before equipment is removed from the field. Only lentil seed free of wild tomato seed, should be sown. It would be wise to include a cereal in the crop rotation, and to avoid seeding lentils on land with a history of wild tomato.

Wild tomato densities and Colorado potato beetle interaction, is a critical factor when determining harvest difficulties. Their interaction must be weighed when determining an acceptable level of wild tomato control in the spring. If we control 90% of the wild tomato in the spring, do we increase harvest difficulty? What wild tomato density is sufficient to attract Colorado potato beetles? Are the economic benefits of Colorado potato beetle as a natural biological control agent, of equal importance as yield loss incurred through wild tomato competition? What are the implications for potato producers in Saskatchewan?

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