

**STUDIES ON SEEDBED STERILISATION, DISEASE AND WEED CONTROL
METHODS FOR PAPRIKA (*Capsicum annuum* L.) IN THE SMALLHOLDER
FARMING SECTOR OF ZIMBABWE.**

by

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**A thesis submitted in partial fulfillment of the requirements
for the degree of Master of Philosophy.**

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STUDIES ON SEEDBED STERILISATION, DISEASE AND WEED CONTROL METHODS FOR PAPRIKA (*Capsicum annuum* L.) IN THE SMALLHOLDER FARMING SECTOR OF ZIMBABWE.

Submitted by **MAXWELL HANDISENI** in partial fulfillment of the requirements of the degree of **MASTER OF PHILOSOPHY IN CROP SCIENCE (PLANT PATHOLOGY)**.

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ABSTRACT

The objective of this study carried out in 2000/01, 2001/02 and 2002/03 rainy seasons in Chinyika Resettlement Area (CRA) was to develop cost effective crop protection practices in the nursery and field for paprika production. A survey carried out in CRA in 2001/02 rainy season revealed that most farmers lacked knowledge of paprika diseases identification. Ten percent of the farmers did not sterilise their seedbeds and those who did, used the method of burning of brushwood. Forty percent of the paprika farmers did not apply any fungicides for disease control during the course of production, where as among those who did, the majority sprayed only once a season. Laboratory analysis of samples taken from the farmers fields revealed that, powdery mildew (*Leveillula* spp) (35.6%), bacterial leaf spot (24.4%) and grey leaf spot (*Stemphylium* spp)(18.1%) were the major paprika diseases in CRA. Soil sterilization methods of seedbeds namely; burning of cowdung, brushwood or maize cobs, solarisation and methyl bromide were investigated. Solarisation raised soil temperatures to as high as 39.4 °C at 5cm soil depth. Burning of brushwood and cowdung treatments resulted in significantly ($p < 0.05$) highest soil temperatures at different sites and seasons. Methyl bromide, solarisation and maize cob treated seedbeds produced seedlings of significantly ($p < 0.05$) higher seedling dry weight than non the seedlings from non sterilized control in 2001/02. Brushwood treated seedbeds resulted in the least bacterial population at 5cm and solarisation had the least at 10cm and 15cm. Area under disease progress curve (AUDPC) for disease incidence was least ($p < 0.05$) in the brushwood treated seedbeds. Methyl bromide and use of brushwood had a seedling emergence which was significantly ($p < 0.05$) higher, 61% and 57.3% respectively than non sterilised control in 2001/02 season. Six fungicide spraying regimes for disease control were also investigated namely; fungicide weekly interval spray, sulphur (320g active ingredient (a.i./ha)) at 2 weeks after transplanting (WAT) and copper oxychloride (255g a.i./ha) - mancozeb (120g a.i./ha) mixture at 6WAT, spraying after scouting, alternating sulphur (320g a.i./ha) and copper oxychloride (255g a.i./ha) - mancozeb (120g a.i./ha) every two weeks, acibenzolar s-methyl (2.5g a.i./ha) and unsprayed (control). The major diseases observed in the two rainy seasons of study were bacterial leaf spot (*Xanthomonas* spp), cercospora leaf spot (*Cercospora* spp), grey leaf spot (*Stemphylium* spp), bacterial soft rot (*Erwinia* spp) and powdery mildew (*Leveillula* spp). Fungicide weekly sprayed plots resulted in the highest added profit of Z\$75 930/ha which was not statistically different ($p > 0.05$) from Z\$59 410/ha achieved by alternating sulphur and a mixture of copper oxychloride - mancozeb mixture fortnightly in 2000/01 rainy season. There were no statistical differences ($p > 0.05$) between spraying after scouting and acibenzolar-s-methyl application treatments. The most cost – effective disease management practice was alternating spray of sulphur and copper oxychloride-mancozeb mixture fortnightly. The effect of weed management methods on disease and yield of paprika were also investigated at two sites. The weeding treatments were; hand hoe weeding at 2 and 6 weeks after transplanting (WAT), re-ridging at 3,6 and 9 WAT, 160l a.i./ha alachlor (Lasso) a day after transplanting and a tank mixture of alachlor 80l a.i./ha and oxidiazon (Ronstar) at 96l a.i./ha a day before transplanting and a no weeding treatment (control). Major weeds observed in the two seasons at both sites were; mexican clover [*Ricardia scabra* (L)], black jack [*Bidens pilosa* (L.)], stinkblaar [*Datura stramonium* (L)] and Apple of Peru [*Nicandra physalodes* (L.)]. In 2000/01 season hand weeding treatments had the lowest AUDPC disease incidence, weed density and highest marketable yield. In the 2001/02 season, both herbicide treatments had the same effect as hand weeding and re-ridging on AUDPC and marketable yield. Weed density and biomass were statistically the same across all treatments except the control in 2001/02 season. Hand weeding operations resulted in highest added profits. The use of herbicides and a supplementary hand weeding between 5-6 WAT is the best economic option for weed control.

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DEDICATION

To the glory of the Almighty God who enables me to achieve all things.

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