HARDENING, POPULATION AND FERTILIZER EFFECTS ON PAPRIKA (*Capsicum annuum* L.) ESTABLISHMENT AND YIELD IN CHINYIKA RESETTLEMENT AREA, ZIMBABWE

BY

SYDNEY MAVENGAHAMA

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FACULTY OF AGRICULTURE
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The undersigned certify that they have read and recommend to the Department of Crop Science, the thesis entitled:

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Submitted by **SYDNEY MAVENGAHAMA** in partial fulfillment of the requirements for the degree of **MASTER OF PHILOSOPHY (AGRONOMY**)

Approved

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Dr. A.B. Mashingaidze, Chairperson

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Mrs. J. Sibiya, Supervisor

Date:……..

ABSTRACT

On–farm trials on paprika (*Capsicum annuum* L.) agronomy were carried out in Chinyika Resettlement Area during the 2000/1 to 2002/3 cropping seasons. The effect of nursery seedling density and hardening treatment on seedling vigour and field establishment ability of paprika transplants was studied. There were three seedling densities (450, 750 and 1500 seedlings m^{-2}) and three hardening methods (a) (H0) no hardening: seedlings were watered until date of transplanting, b) (H1) watering of seedlings was stopped two weeks prior to transplanting. They were only given survival irrigation when they wilted severely, and c) (H2) water was gradually withheld by skipping a day during the fifth week, skipping two days during the sixth and completely withholding water beginning of week seven). Watering was done only when plants showed signs of wilting by 10:00am. The currently recommended seedling density of 1500 seedling m^{-2} produced weak seedlings, which gave high post-transplant mortality. The best seedlings were produced with densities of 450 and 750 seedlings m^{-2}.

The response of two paprika cultivars, PapriKing and Red Tsar, to various hardening treatments was also evaluated. The six hardening methods compared were: H0 – Seedlings were well watered up to the day of transplanting, i.e. no hardening, H1 – watering stopped during the last two weeks preceding transplanting (farmer practice), H2 – water withheld gradually by skipping a day during the 5^{th} and skipping 2 days during the 6^{th} week and then completely in the 7^{th} and 8^{th} weeks, H3 – watering stopped in the 5^{th} and 7^{th} weeks only, H4 – water withheld in the 6^{th} and 7^{th} week only and H5 – water withheld in the fifth week and only watered when seedlings showed signs of wilting by 10:00 am. There were significant interactions between cultivar and hardening method with respect to field establishment. Red Tsar was very susceptible to post-transplant mortality when it was not hardened and had the lowest ($p<0.05$) field establishment.

The effect of plant population and spatial arrangement on paprika yield was studied. Plants were arranged either as one row or two rows per ridge. There were four plant populations as follows: 35 000, 50 000, 65 000 and 80 000 plants per hectare. Paprika yield increased significantly ($p<0.05$) as plant population was increased from 35 000 plants per hectare to 65 000 plants per hectare in 2000/1 and up to 80 000 plants per hectare in 2001/2 cropping season.

The effects of different types of basal fertilizers and timing of top dressing on paprika fruit yield and quality (ASTA content) were evaluated. There were four basal fertiliser levels as follows: no basal fertiliser (control), cattle manure (5 000 kg/ha), Compound L (5 N:18 P_2O_5:10 K_2O) (200 kg/ha), and Compound D (7 N;14 P_2O_5;7 K_2O) (200 kg/ha) Ammonium nitrate (AN) (34.5%N) topdressing had three levels: no topdressing (control), 350 kg/ha AN applied either as a single application 4 weeks after transplanting (WAT) or as an equal split at 4 and 8 WAT. Compound L and Compound D fertilizers and manure resulted in higher yields compared with the no basal fertiliser control. In the 2001/2 and 2002/3 cropping seasons there were no significant ($p<0.05$) differences in yield due to either splitting of AN or application as single dose but these two treatments had significantly higher ($p<0.05$) yields that the non-application of AN (control).

The main conclusions from this study are: (1) withholding water in the last two weeks prior to transplanting leads to production of seedlings that can withstand post-transplant stress, (2) reducing nursery seedling density from 1500 seedlings m^{-2} to 750 seedlings m^{-2} and below leads to the production of vigorous seedlings that have high rates of survival when transplanted, (3) paprika fruit yield increases as plant population is increased from 35 000 to 65 000 plants/ha and (4) application of basal fertilizer and AN top dressing increases paprika fruit yield. Farmers are recommended to continue with the current practice of hardening their seedlings in the last two (7^{th} and 8^{th}) weeks prior to transplanting. Seedling density in the nursery needs to be reduced to 750 seedlings m^{-2} while plant population in the field is increased to 65 000 plants/ha. Compound "D" and cattle manure can be used as basal fertilizers for paprika production and smallholder farmers are encouraged to use them.

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Dedicated to the smallholder sector farmers in Zimbabwe and those who strive to uplift them

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LIST OF ABBREVIATIONS

AA	Atomic Absorption
Agritex	Agricultural Technical and Extension Services
a.i	active ingredient
AN	Ammonium Nitrate
ASTA	American Spice Traders Association
B	boron
BER	blossom end rot
Ca	calcium
cm	centimetres
CRA	Chinyika Resettlement Area
Cu	copper
cv	cultivar
DAT	days after transplanting
F_2	Filial generation 2
Fe	iron
g	grams
ha	hectare
ICM	Integrated Crop Management
ICMR	Integrated Crop Management Research
K	potassium
kg	kilogramme
kg/ha	kilogrammes per hectare
m	metres
ME	milliequivalents
mM	millimoles
Mn	manganese
N	nitrogen
ns	not significant
^oC	degrees Celsius
P	phosphorus
PNC	pretransplant nutritional conditioning
ppm	parts per million
Pvt. Ltd.	Private Limited
SH	smallholder
WAS	weeks after sowing
WAT	weeks after transplanting
WP	wettable powder
Zn	zinc