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**A STUDY ON THE EFFECTS OF LOW TEMPERATURE PRE-SOWING  
TREATMENTS AND AGEING ON THE GERMINATION  
PERFORMANCE OF DIFFERENT TOMATO SEED LOTS**

A thesis presented in partial fulfilment  
of the requirements for  
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by  
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## ABSTRACT

Although the total germination capacities were not significantly different, ten different tomato seed lots differed in their vigour. LTPST caused significant improvement in germination rate both in high and low vigour seed lots of different cultivars of tomato seeds tested without altering their germination potential. The degree of improvement in germination rate was positively related to the initial germination rate of the seed lots and it was even possible to predict the effectiveness of the treatment based on the initial T50 of untreated seeds. Despite the treatment always causing a significant improvement in germination rate, the improvement in uniformity was lot-dependent and the treatment had little or no effect on initial seedling growth.

Increased SMC and temperature caused rapid loss of viability and germination rate during storage. The effectiveness of LTPST treatment before ageing differed with seed lot and subsequent ageing conditions used. The application of the LTPST after ageing restored the germination rate to that of unaged untreated seed but as expected had no effect on loss of viability. The survival pattern of tomato seeds under rapid ageing followed a normal distribution and parameters of survival curves were in agreement with the norms of the general viability model for orthodox seeds. On the basis of these results of LTPST on aged seeds, it is argued that factors affecting loss of seed vigour may be different from those causing loss of seed viability during storage.

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## CHAPTER I

### INTRODUCTION

Technological advancement has transformed traditionally low cost self-sustaining agriculture into an advanced capital intensive farming business aimed at maximizing net earnings. Today's management of farming aims at averting risks as much as possible. Getting timely, uniform and optimal stands of vigorous plants is a pre-requisite for this success, therefore the world farming community is demanding high quality seed suitable for sowing under all sowing conditions.

There is an enormous literature suggesting that pre-sowing treatments of various kinds could improve the planting quality of seeds. In particular, hydration treatments are reasonably successful in inducing early emergence with consequent improvement in plant growth, early harvesting and better yields although any improvement in relative growth rates of ensuing plants is debatable (Coolbear et al., 1987).

Some seed companies in USA and UK are already using pre-sowing seed treatments, particularly in vegetable crops. One major obstacle to the commercial application of pre-sowing treatments is the variability between cultivars and even between the seed lots of the same cultivar. There is very little literature demonstrating the repeatability and applicability of pre-sowing seed treatments to different seed lots and/or cultivars of the same species. Thus, one of the main aims of this study was to investigate the effects of low temperature pre-sowing seed treatment (LTPST) on the germination performance of different cultivars and/or seed lots of tomato seeds and to determine whether treatment improves seed quality in different seed lots of tomato.

The commercial operation of seed production and marketing inevitably involves a transition stage of storage. The physical, physiological and biological factors affecting seed storability have been reasonably well established, seed moisture content and storage temperature being the most important factors in storage, exerting a great effect on the vigour and viability of the seed (Chin, 1988). Despite an enormous literature on seed storage there are only a few reports indicating the responses of different seed lots under the same

storage conditions. In tomato, the literature reviewed from 1978 suggests none. Pre-sowing treatments have also been used to retard seed deterioration during storage with mixed success and to improve the quality of stored seeds.

Tomato seeds was chosen for this investigation as it is economically the second most important vegetable crop in the world. Pre-sowing treatment LTPST of tomato seeds has already been shown to improve the seed quality (Coolbear et al., 1987) and also to protect or improve germination rate of stored seeds (Coolbear et al., 1984). LTPST was chosen to investigate its effects on different cultivars and seed lots of tomato seeds in storage as a continuation of this work.

### **Objectives of this study**

With a view to exploring potential of LTPST as a pre-sowing and pre- and post- storage treatment, this study was designed with the following objectives:

- a) To investigate the variation in response between cultivars and seed lots of tomato seeds to LTPST.
- b) To investigate the variation in response between different cultivars and seed lots of tomato seeds to LTPST applied before and after ageing.