

**THE PRIMING OF SEEDS**

**Investigations into a method of priming large quantities  
of seeds using salt solutions.**

by

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**A thesis submitted in fulfilment of the requirements for the  
degree of Master of Science at Macquarie University,  
School of Biological Sciences.**

**September, 1983.**

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## TABLE OF CONTENTS

	Page
SUMMARY	i
CERTIFICATE	iii
ACKNOWLEDGEMENTS	iv
LIST OF TABLES	v
LIST OF FIGURES	xi
<b>CHAPTER 1. INTRODUCTION AND BACKGROUND</b>	<b>1</b>
1.1 INTRODUCTION	1
1.2 THE HISTORY OF SEED-SOAKING TREATMENTS	3
1.3 METHODS USED TO PRIME SEEDS	7
Polyethylene glycol methods	8
Salt solution methods	10
1.4 GERMINATION IN RELATION TO WATER SUPPLY	12
Water uptake	12
Water supply from the germination medium	16
1.5 PHYSIOLOGICAL MECHANISMS INVOLVED IN PRIMING	21
<b>CHAPTER 2. THE TIME COURSE OF GERMINATION AND ITS ANALYSIS</b>	<b>26</b>
<b>CHAPTER 3. OSMOTIC EFFECTS ON GERMINATION</b>	<b>30</b>
3.1 MATERIALS AND METHODS	31
3.2 RESULTS	34
Responses of tomato seeds	34
Responses of carrot seeds	43
Responses of onion seeds	52
Responses of sorghum E 57 seeds	60
Responses of sorghum E 55e seeds	68
3.3 CONCLUSIONS	72

<b>CHAPTER 4.</b>	<b>HIGH-HUMIDITY HYDRATION OF SEEDS</b>	<b>75</b>
4.1	MATERIALS AND METHODS	75
4.2	RESULTS	76
4.3	CONCLUSIONS	78
<b>CHAPTER 5.</b>	<b>TECHNIQUES OF PRIMING</b>	<b>79</b>
5.1	THE INTERACTION OF TEMPERATURE AND DURATION OF PRIMING ON THE EMERGENCE OF TOMATO, CARROT AND ONION SEEDS	80
	Methods	80
	Results	81
	Tomato	81
	Carrot	83
	Onion	85
5.2	THE PRIMING OF CARROT SEEDS USING A COLUMN OF AERATED SOLUTION	88
	Methods	88
	Results	89
5.3	THE EFFECT OF DURATION OF PRIMING IN OPTIMAL SOLUTIONS ON THE GERMINATION OF TOMATO AND CARROT SEEDS	90
	Methods	90
	Results	91
	Tomato	91
	Carrot	93
5.4	THE EFFECTS OF DRYING PRIMED SEEDS	95
	Methods	95
	Results	95
5.5	CONCLUSIONS	100

<b>CHAPTER 4. HIGH-HUMIDITY HYDRATION OF SEEDS</b>	<b>75</b>
4.1 MATERIALS AND METHODS	75
4.2 RESULTS	76
4.3 CONCLUSIONS	78
<b>CHAPTER 5. TECHNIQUES OF PRIMING</b>	<b>79</b>
5.1 THE INTERACTION OF TEMPERATURE AND DURATION OF PRIMING ON THE EMERGENCE OF TOMATO, CARROT AND ONION SEEDS	80
Methods	80
Results	81
Tomato	81
Carrot	83
Onion	85
5.2 THE PRIMING OF CARROT SEEDS USING A COLUMN OF AERATED SOLUTION	88
Methods	88
Results	89
5.3 THE EFFECT OF DURATION OF PRIMING IN OPTIMAL SOLUTIONS ON THE GERMINATION OF TOMATO AND CARROT SEEDS	90
Methods	90
Results	91
Tomato	91
Carrot	93
5.4 THE EFFECTS OF DRYING PRIMED SEEDS	95
Methods	95
Results	95
5.5 CONCLUSIONS	100

<b>CHAPTER 6. FIELD EMERGENCE OF PRIMED SEEDS</b>	<b>103</b>
6.1 METHODS	103
6.2 RESULTS	104
Tomato	104
Carrot	111
Onion	117
6.3 CONCLUSIONS	120
<b>CHAPTER 7. DISCUSSION</b>	<b>122</b>
7.1 PRIMEABLE SEEDS	122
7.2 EFFECTS OF SALTS	123
7.3 EFFECTS OF TEMPERATURE	125
7.4 LARGE SCALE PRIMING	126
7.5 PRIMED SEEDS IN THE FIELD	126
7.6 CONCLUSIONS	127
<b>REFERENCES CITED</b>	<b>128</b>
<b>APPENDIX 1</b>	<b>143</b>

### SUMMARY

Seed priming, which involves the hydration of seeds in an osmotic solution before sowing, produces seeds with improved germination performance. This study was aimed at optimizing the priming of tomato, carrot, onion and sorghum seeds by a method which could be readily scaled up for commercial use.

Initially, to determine appropriate priming solutions, the germination responses of the four species to a range of osmotic potentials from 0 to -1.75 MPa in a range of osmotica -  $K_2HPO_4$ ,  $K_3PO_4$ ,  $KNO_3$ ,  $K_2HPO_4 + KNO_3$ ,  $K_3PO_4 + KNO_3$  and Polyethylene glycol (PEG) - were investigated.

The most effective priming treatment was shown to be one in which the osmoticum prevented germination without being toxic, at a high osmotic potential. There were marked interactions between species, osmotic potential and the osmoticum used for priming. Tomato seeds were readily primed in any of the series of salt or PEG solutions. All of the solutions tried were adequate for carrot seeds. Onion seeds could be primed in either  $K_2HPO_4$ ,  $K_3PO_4$  or PEG solutions; however, all solutions were toxic to sorghum seeds or failed to prevent germination.

The selected priming treatment was further optimized by experiments that investigated the influence of duration and temperature of priming. Priming at a lower temperature for a longer time was more beneficial than at higher temperatures. However, priming for too long a period was found to have adverse effects. Tomato seeds showed improved performance after priming for 16 to 18 days at 15 C whereas for carrot seeds a duration of

8 to 10 days was adequate, but prolonged treatment led to reduced germination percentages. Columns of aerated solutions were found to be suitable for the priming of large quantities of tomato and carrot seeds. Air-drying of primed tomato and carrot seeds was possible without loss of germinability or priming effect.

Limited field experiments at Yanco Agricultural Research Centre showed that primed tomato and carrot seeds emerged twice as fast as untreated seeds and had improved uniformity of emergence, particularly at low soil temperatures. These benefits from priming were maintained through to the first true leaf stage of development.

It was concluded that it was possible to prime certain seeds in simple salt solutions by a method capable of expansion to commercial scales of operation and produce benefits to emergence which were maintained after drying to facilitate sowing using existing drilling equipment.

**CERTIFICATE**

I hereby declare that this work has not been  
submitted for a higher degree to any other  
university or institution.

A handwritten signature in black ink, appearing to read "Tony Haigh". The signature is written in a cursive style with a long, sweeping tail on the final letter.

Anthony M. Haigh

**ACKNOWLEDGEMENTS**

The work reported in this thesis was conducted at the School of Biological Sciences, Macquarie University and at the Agricultural Research Centre, Yanco. It was financially supported by the Rural Credits Development Fund.

I would like to sincerely thank Dr. E.W.R. Barlow who as my supervisor provided encouragement and support during the research and through the preparation of this thesis. I would also like to particularly thank Emeritus Prof. F.L. Milthorpe who provided considerable guidance and was always willing to discuss the work. I am grateful for the friendly and supportive environment created by the personnel of the School of Biological Sciences whose contribution was invaluable. Similarly, assistance was provided by the staff of the Agricultural Research Centre during my time there, especially by Mr. P. Sinclair, for which I would like to give thanks.

I would also like to acknowledge the assistance of Ms. E. Adamson who provided assistance with entering of data into the computer and Ms. P. Bolton who typed the original draft of this thesis into the word-processor.

**LIST OF TABLES**

		Page
Table 1.	Priming treatments using polyethylene glycol solutions.	9
Table 2.	Priming methods using salt solutions.	11
Table 3.	Concentrations of salts and PEG used for osmotic potential solutions.	33
Table 4.	The effect of osmotica and osmotic potential on the maximum percentage germination of tomato seeds.	35
Table 5.	The effect of osmotica and osmotic potential on the median rate of germination of tomato seeds.	35
Table 6.	The effect of osmotica and osmotic potential on the time to 5% germination and on the time-spread of germination of tomato seeds.	37
Table 7.	The effect of osmotica and osmotic potential of the pretreatment solution on the maximum percentage germination of tomato seeds on subsequent transfer to water.	39
Table 8.	The effect of osmotica and osmotic potential of the pretreatment solution on the median rate of germination of tomato seeds on subsequent transfer to water.	39
Table 9.	The effect of osmotica and osmotic potential of the pretreatment solution on the time to 5% germination and on the time-spread of germination of tomato seeds on subsequent transfer to water.	41
Table 10.	The effect of osmotica and osmotic potential on the maximum percentage germination of carrot seeds.	44
Table 11.	The effect of osmotica and osmotic potential on the median rate of germination of carrot seeds.	44
Table 12.	The effect of osmotica and osmotic potential on the time to 5% germination and on the time-spread of germination of carrot seeds.	46

Table 13.	The effect of osmotica and osmotic potential of the pretreatment solution on the maximum percentage germination of carrot seeds on subsequent transfer to water.	48
Table 14.	The effect of osmotica and osmotic potential of the pretreatment solution on the median rate of germination of carrot seeds on subsequent transfer to water.	48
Table 15.	The effect of osmotica and osmotic potential of the pretreatment solution on the time to 5% germination and on the time-spread of germination of carrot seeds on subsequent transfer to water.	50
Table 16.	The effect of osmotica and osmotic potential on the maximum percentage germination of onion seeds.	53
Table 17.	The effect of osmotica and osmotic potential on the median rate of germination of onion seeds.	53
Table 18.	The effect of osmotica and osmotic potential on the time to 5% germination and on the time-spread of germination of onion seeds.	55
Table 19.	The effect of osmotica and osmotic potential of the pretreatment solution on the maximum percentage germination of onion seeds on subsequent transfer to water.	57
Table 20.	The effect of osmotica and osmotic potential of the pretreatment solution on the median rate of germination of onion seeds on subsequent transfer to water.	57
Table 21.	The effect of osmotica and osmotic potential of the pretreatment solution on the time to 5% germination and on the time-spread of germination of onion seeds on subsequent transfer to water.	58
Table 22.	The effect of osmotica and osmotic potential on the maximum percentage germination of sorghum E 57 seeds.	61
Table 23.	The effect of osmotica and osmotic potential on the median rate of germination of sorghum E 57 seeds.	61
Table 24.	The effect of osmotica and osmotic potential on the time to 5% germination and on the time-spread of germination of sorghum E 57 seeds.	63

Table 25.	The effect of osmotica and osmotic potential of the pretreatment solution on the maximum percentage germination of sorghum E 57 seeds on subsequent transfer to water.	65
Table 26.	The effect of osmotica and osmotic potential of the pretreatment solution on the median rate of germination of sorghum E 57 seeds on subsequent transfer to water.	65
Table 27.	The effect of osmotica and osmotic potential of the pretreatment solution on the time to 5% germination and on the time-spread of germination of sorghum E 57 seeds on subsequent transfer to water.	66
Table 28.	The effect of osmotica and osmotic potential on the maximum percentage germination of sorghum E 55e seeds.	69
Table 29.	The effect of osmotica and osmotic potential on the median rate of germination of sorghum E 55e seeds.	69
Table 30.	The effect of osmotica and osmotic potential on the time to 5% germination and on the time-spread of germination of sorghum E 55e seeds.	70
Table 31.	Highest osmotic potential (MPa) required to prevent germination in a range of osmotica and the subsequent germination (%) of seeds so exposed when placed in water.	73
Table 32.	The effect of hydration of sorghum E 57 seeds in atmospheres of high humidity on the maximum percentage emergence at 20 C.	77
Table 33.	The effect of hydration of sorghum E 57 seeds in atmospheres of high humidity on the median rate of emergence at 20 C.	77
Table 34.	The effect of hydration of sorghum E 57 seeds in atmospheres of high humidity on the time to 5% emergence and the time-spread of emergence at 20 C.	77
Table 35.	The effect of temperature and duration of priming of tomato seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ on the maximum percentage emergence at 15 C.	82
Table 36.	The effect of temperature and duration of priming of tomato seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ on the median rate of emergence at 15 C.	82

Table 37.	The effect of temperature and duration of priming of tomato seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ on the time to 5% emergence and the time-spread of emergence at 15 C.	82
Table 38.	The effect of temperature and duration of priming of carrot seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ on the maximum percentage emergence at 15 C.	84
Table 39.	The effect of temperature and duration of priming of carrot seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ on the median rate of emergence at 15 C.	84
Table 40.	The effect of temperature and duration of priming of carrot seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ on the time to 5% emergence and the time-spread of emergence at 15 C.	84
Table 41.	The effect of temperature and duration of priming of onion seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ on the maximum percentage emergence at 15 C.	86
Table 42.	The effect of temperature and duration of priming of onion seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ on the median rate of emergence at 15 C.	86
Table 43.	The effect of temperature and duration of priming of onion seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ on the time to 5% emergence and the time-spread of emergence at 15 C.	86
Table 44.	The effect of priming carrot seeds at 15 C for 14 days in aerated columns of solution of 0.105M $K_3PO_4$ + 0.209M $KNO_3$ on their emergence at 15 C.	89
Table 45.	The effect of drying following priming, in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days, on the maximum percentage emergence at 15 C of tomato seeds.	96
Table 46.	The effect of drying following priming, in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days, on the median rate of emergence at 15 C of tomato seeds.	96
Table 47.	The effect of drying following priming, in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days, on the time to the 5% emergence and the time-spread of emergence at 15 C of tomato seeds.	96
Table 48.	The effect of drying with or without fan assistance following priming, in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days, on the maximum percentage emergence at 15 C of carrot seeds.	98

Table 49.	The effect of drying with or without fan assistance following priming, in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days, on the median rate of emergence at 15 C of carrot seeds.	98
Table 50.	The effect of drying with or without fan assistance following priming, in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days, on the time to the 5% emergence and the time-spread of emergence at 15 C of carrot seeds.	98
Table 51.	The effect of priming tomato seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days on the maximum percentage field emergence.	105
Table 52.	The effect of priming tomato seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days on the median rate of field emergence.	105
Table 53.	The effect of priming tomato seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days on the time to 5% field emergence and the time-spread of field emergence.	107
Table 54.	The effect of post-priming air-drying of tomato seeds on their field emergence.	107
Table 55.	The effect of priming tomato seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days on the maximum percentage of seedlings to attain first true leaves.	109
Table 56.	The effect of priming tomato seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days on the median rate of attainment of first true leaves.	109
Table 57.	The effect of priming tomato seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days on the time to 5% attainment of first true leaves and the time-spread of attainment of first true leaves.	110
Table 58.	The effect of priming carrot seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days on the maximum percentage field emergence.	112
Table 59.	The effect of priming carrot seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days on the median rate of field emergence.	112
Table 60.	The effect of priming carrot seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days on the time to 5% field emergence and the time-spread of field emergence.	113

Table 61.	The effect of post-priming air-drying of carrot seeds on their field emergence.	113
Table 62.	The effect of priming carrot seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days on the maximum percentage of seedlings to attain first true leaves.	115
Table 63.	The effect of priming carrot seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days on the median rate of attainment of first true leaves.	115
Table 64.	The effect of priming carrot seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days on the time to 5% attainment of first true leaves and the time-spread of attainment of first true leaves.	116
Table 65.	The effect of priming onion seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days on the maximum percentage field emergence.	118
Table 66.	The effect of priming onion seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days on the median rate of field emergence.	118
Table 67.	The effect of priming onion seeds in 0.105M $K_3PO_4$ + 0.209M $KNO_3$ at 15 C for 14 days on the time to the beginning of field emergence and the time-spread of field emergence.	119
Table 68.	The effect of post-priming air-drying of onion seeds on their field emergence.	119

## LIST OF FIGURES

	Between pages
Figure 1. The triphasic pattern of water uptake by germinating seeds.	12-13
Figure 2. The emergence of unprimed tomato seeds from sand at 20 C.	26-27
Figure 3. The effect of duration of priming of tomato seeds in 0.090M $K_2HPO_4$ + 0.118M $KNO_3$ or in 0.079M $K_3PO_4$ at 15 C on: (a) the maximum percentage germination, (b) the median rate of germination, (c) the time to 5% germination, (d) the time-spread of germination at 15 C.	91-92
Figure 4. The effect of duration of priming of tomato seeds in 0.090M $K_2HPO_4$ + 0.118M $KNO_3$ or in 0.079M $K_3PO_4$ at 15 C on the rate of germination of the fifth-percentile seed to germinate.	92-93
Figure 5. The effect of duration of priming of carrot seeds in 0.102M $K_3PO_4$ + 0.204M $KNO_3$ at 15 C on: (a) the maximum percentage germination, (b) the median rate of germination, (c) the time to 5% germination, (d) the time-spread of germination at 15 C.	93-94