

CONTENTS

DECLARATION	i
ACKNOWLEDGMENT	iii
ABSTRACT	iv
CONTENTS	v
LIST OF TABLES.....	vii
LIST OF FIGURES	x
CHAPTER 01- INTRODUCTION	1
CHAPTER 02 - LITERATURE REVIEW	4
2.1 Big onion	4
2.1.1 Taxonomic classification.....	4
2.1.2 Structure of big onion plant.....	4
2.1.3 Growth	6
2.1.4 Climate and day length requirements for bulbing	6
2.2 Agronomy.....	8
2.2.1 Nursery establishment.....	8
2.2.2 Field establishment.....	9
2.2.3 Pest and disease control	11
2.2.4 Harvesting & post-harvesting technology	13
2.3 Big onion cultivation in Sri Lanka.....	13
2.3.1 Areas cultivating big onion in Sri Lanka.....	15
2.3.2 Constraints of big onion production in Sri Lanka.....	18
2.4 Crop weed interaction.....	19
2.4.1 Crop weed competition.....	20
2.4.2 Factors affecting for weed competition	23
2.4.3 Models developed to estimate yield loss due to weed competition	28
2.4.4 Weed thresholds.....	29

2.4.5 Critical period of weed competition in big onion.....	30
2.4.6 Importance of finding the critical period of weed competition in big onion ...	32
2.4.7 Common weeds in big onion cultivation in Sri Lanka	33
2.4.8 Determination of CPWC for crops	33
CHAPTER 03 - METHODOLOGY.....	35
3.1 Experimental site:	35
3.2 Land preparation:.....	35
3.3 Treatments	36
3.3.1 Experiment 1- Increasing the length of weed free period	36
3.3.2 Experiment 2 -Increasing the weedy period.....	37
3.4 Data collection.....	37
3.5 Data analysis.....	37
3.5.1 Determination of critical weed free period	37
CHAPTER 04 - RESULTS AND DISCUSSION.....	40
4.1 Climatic conditions of the experimental sites.....	40
4.2 Critical weed free period in big onion at agro-ecological zone DL _{1b} during early Yala season	42
4.3 Critical weed free period in big onion at agro-ecological zone DL _{1b} during Yala season.....	48
4.4 Critical weed free period in big onion at agro-ecological zone DL ₅ during Maha season 2014/15	54
4.5 Critical weed free period in big onion at agro-ecological zone DL ₅ during Yala season 2015.....	60
CHAPTER 05 - CONCLUSION	68
CHAPTER 06 - REFERENCES.....	69

LIST OF TABLES

Page No

CHAPTER 2

Table 2.1: Various fungicides and recommended rates use to sterilize nursery beds before onion establishment in Sri Lanka	09
Table 2.2: Recommended Fertilizers for big onion; (Source: Department of Agriculture in Sri Lanka)	11
Table 2.3: The critical period of weed competition of different crops (Source: http://www.agridr.in)	28

CHAPTER 4

Table 4.1: Effect of weed competition at different periods on onion yield under the weed free and weed infested conditions at the agro-ecological zone DL _{1b} , during the early Yala season	43
Table 4.2: Parameter estimates of the Gompertz and Logistic models used to determine the critical timing of weed removal for fresh bulb yield and dry bulb yield. (The models were fitted to relative yield of big onion and expressed as the percentage of the season-long weed free)	47
Table 4.3: The critical period of weed control (CPWC) for big onion calculated from Logistic and Gompertz equations at four acceptable yield loss levels (AYL) expressed as days after transplant (DAT) of fresh yield of onion bulbs and dry yield of onion bulbs	47
Table 4.4: Effect of weed competition at different periods on onion yield at the agro-ecological zone DL _{1b} during the Yala season 2015	49

Table 4.5: Parameter estimates of the Gompertz and Logistic models used to determine the critical timing of weed removal for fresh bulb yield and dry bulb yield. (The models were fitted to relative yield of big onion and expressed as the percentage of the season-long weed free)	53
Table 4.6: The critical period of weed control (CPWC) for big onion calculated from Logistic and Gompertz equations at four acceptable yield loss levels (AYL) expressed as days after transplant (DAT) of fresh yield of onion bulbs and dry yield of onion bulbs	53
Table 4.7: Effect of weed competition at different periods on onion yield at the agro-ecological zone DL ₅ during the 2014/15 Maha Season	55
Table 4.8: Parameter estimates of the Gompertz and Logistic models used to determine the critical timing of weed removal for fresh bulb yield and dry bulb yield. (The models were fitted to relative yield of big onion and expressed as the percentage of the season-long weed free)	59
Table 4.9: The critical period of weed control (CPWC) for big onion calculated from Logistic and Gompertz equations at four acceptable yield loss levels (AYL) expressed as days after transplant (DAT) of fresh yield of onion bulbs and dry yield of onion bulbs	59
Table 4.10: Effect of weed competition at different periods on onion yield under the weeds free condition in the DL ₅ agro-ecological zone Yala season 2015	61
Table 4.11: Parameter estimates of the Gompertz and Logistic models used to determine the critical timing of weed removal for fresh bulb yield and dry bulb yield. (The models were fitted to relative yield of big onion and expressed as the percentage of the season-long weed free)	65

Table 4.12: The critical period of weed control (CPWC) for big onion calculated from Logistic and Gompertz equations at four acceptable yield loss levels (AYL) expressed as days after transplant (DAT) of fresh yield of onion bulbs 65

Table 4.13 The critical period of weed control (CPWC) for big onion calculated from Logistic and Gompertz equations at four acceptable yield loss levels (AYL) expressed as days after transplant (DAT) of fresh yield of onion bulbs and dry yield of onion bulbs in the agro-ecological zones DL_{1b} and DL₅ 66

LIST OF FIGURES

Page No.

CHAPTER 2

- Figure 2.1: Cross section of a “good-shaped” onion bulb (Taylor, 2009) 05
- Figure 2.2: Agro-ecological zones of Sri Lanka. (Source: Department of Agriculture) 17
- Figure 2.3: Illustration for crop-weed competition 23
- Figure 2.4: Relationship between final yield and presence of weeds for various durations of crop growth. 27
- Figure 2.5: Relationship between yield loss and weed density. 29

CHAPTER 4

- Figure 4.1: The variations of monthly rainfall (mm), temperature (°C) and relative humidity at DL_{1b} & DL₅ locations during study period 41
- Figure 4.2: Effect of weeds free and weeds infested Conditions to the yield parameters (A: Number of bulbs, B: Total weight of onion, C: Fresh weight of onion bulbs, D: Dry weight of bulbs) of onion transplanted in early Yala season in the DL_{1b} agro-ecological zone 44
- Figure 4.3: Influence of weed interference on relative yield of big onion in the agro-ecological zone DL_{1b} during early Yala season. 46
- Figure 4.4: Effect of weeds free and weeds infested conditions to the yield parameters (A: Number of bulbs, B: Total fresh weight of onion, C: Fresh weight of onion bulbs, D: Dry weight of bulbs) of onion in the agro-ecological zone DL_{1b} during Yala season 50
- Figure. 4.5: Influence of weed interference on relative yield of big onion at the agro-ecological zone DL_{1b} during Yala season. 52

- Figure 4.6: Effect of weed free and weed infested condition to the yield parameters (A: Total fresh weight of onion, B: Fresh weight of bulbs, C: Dry weight of bulbs, D: Number of bulbs, E: Height of plants) of big onion in the DL₅ agro-ecological zone during 2014/15 Maha season. 56
- Figure 4.7: Influence of weed interference on relative yield of big onion at the agro-ecological zone DL₅ during Maha 2014/15 season. 58
- Figure 4.8: Effect of weed free and weed infested conditions on the yield parameters (A: Total weight of onions, B: Fresh weight of bulbs, C: Dry weight of Onion, D: Diameter of bulbs, E: Number of bulbs, F: Height of plants) of big onion in the DL₅ agro-ecological zone during 2014/15 Maha season 62
- Figure 4.9: Influence of weed interference on relative yield of big onion at the agro-ecological zone DL₅ during Yala 2015 season. 64