EFFECT OF SOME POSTHARVEST TREATMENTS ON SWEET PEPPER FRUIT QUALITY

By

NEAMA MOHAMED HUSSEIN AHMED

B.Sc. Agric. Sc. (Horticulture), Ain Shams University, 2006

A thesis submitted in partial fulfillment

of

The requirements for the degree of

MASTER OF SCIENCE

Agricultural Science
(Vegetable Crops)

Department of Horticulture
Faculty of Agriculture
Ain Shams University

2015

Approval Sheet

EFFECT OF SOME POSTHARVEST TREATMENTS ON SWEET PEPPER FRUIT QUALITY

By

NEAMA MOHAMED HUSSEIN AHMED

B.Sc. Agric. Sc. (Horticulture), Ain Shams University, 2006

This thesis for M. Sc. degree has been approved by

Dr. Shamel Ahmed Shanan ……..
Prof. Emeritus of Vegetable Crops, Department of Horticulture, Faculty of Agriculture, Al-Azhar University.

Dr. Mohamed Hashem El-Deb ……
Prof. Emeritus of Vegetable Crops, Faculty of Agriculture, Ain Shams University.

Dr. Ahmed Abou El-yazied Abd El-Hafize ……..
Prof. of Vegetable Crops, Faculty of Agriculture, Ain Shams University.

Dr. Mamdouh Mohamed Fawzy Abdallah ….…….
Prof. Emeritus of Vegetable Crops, Department of Horticulture, Faculty of Agriculture, Ain Shams University (Principal supervisor).

Date of Examination: 30 / 4 / 2015

EFFECT OF SOME POSTHARVEST TREATMENTS ON SWEET PEPPER FRUIT QUALITY

By

NEAMA MOHAMED HUSSEIN AHMED

B.Sc. Agric. Sc. (Horticulture), Ain Shams University, 2006

Under the supervision of:

Dr. Mamdouh Mohamed Fawzy Abdallah

Prof. Emeritus of Vegetable Crops, Department of Horticulture, Faculty of Agriculture, Ain Shams University (Principal supervisor).

Dr.Ahmed Abou El-yazied Abd El-Hafize

Prof. of Vegetable Crops, Department of Horticulture, Faculty of Agriculture, Ain Shams University.

Dr.Rawia El-bassiouny Ibrahim El-bassiouny

Head of Research Emeritus of Vegetable Handling, Horticulture Research Institute, Agricultural Research Center.

ABSTRACT

Neama Mohamed Hussein Ahmed: Effect of some Postharvest Treatments on Sweet Pepper Fruit Quality. Unpublished M.Sc. Thesis, Department of Horticulture, Faculty of Agriculture, Ain Shams University, 2015.

Storage experiment was conducted on sweet pepper fruits testy F_1 hybrid during two successive seasons (2011-2012 and 2012 -2013) to study the effect of hot water at (45 and 55˚C), chitosan at the concentration of 0.5 and 1% and combined between them as postharvest treatment in reducing chilling injury and mainlining quality of fruits during storage at 5 and 8˚C for 28 days. For hot water treatment, the obtained results revealed that sweet pepper fruits dipped in hot water at 45˚C was the most effective treatment in reducing chilling injury (pitting , calyx darkening and seed darkening), weight loss and shriveling and maintained high content of total soluble solids, ascorbic acid and total carotenoids after 28 days of storage at 5˚C as compared with untreated control. Sweet pepper fruits sprayed with chitosan at 0.5 or 1% were much better in reducing chilling injury and had significantly greater fruit firmness and retained highest values of total carotenoids after 28 days of storage at 5˚C as compared with untreated control.
No decay was observed in sweet pepper fruits treated with hot water at 45˚C + chitosan at 0.5% or 1% and stored at 5 or 8˚C, however, untreated control stored at 5˚C gave the highest value of decay incidence. This treatment storage at 5˚C did not develop any pitting treatment and seed darkening after 21 days of storage and gave traces if these character of the fruits after 28 days of storage.

Key Words: Sweet Pepper, Hot water, Chitosan, Postharvest, Storage temperature, Chilling injury.

ACKNOWLEDGEMENT

First of all, My high praise and gratitude are addressed to Allah, the almighty. Who enabled me to choose the right path and work diligently to achieve my goals.

My high recognition and specific appreciation are also dedicated to **Prof. Dr. Mamdouh Mohamed Fawzy Abdallah** who was a great help to me in achieving this work by his continuous advice and fruitful guidance and tangible contribution.

I wish to express my sincere thanks, deepest gratitude and appreciation to **Dr. Ahmed Abou El-yazied Abd El-Hafize**, Professor of Vegetable Crops, Faculty of Agriculture, Ain Shams University, for suggesting the problem, his active supervision, continued assistance, and scientific guidance through the course of my study.

Also, truthful appreciation and gratitude are due to **Dr. Rawia El-bassiony Ibrahim El-bassiony**, Head Research, Vegetable Handling Research Department, Horticulture Research Institute, Agricultural Research Center, for his supervision, encouragement, valuable advice, generosity, and offering every possible help during the preparation of this work.

Special thanks also to Prof **DR. Said Zakarey Abd El Rahman,** Head Research, Vegetable Handling Research Department, Horticulture Research Institute, Agricultural Research Center, for his help valuable advices and kind help

I would like to thank **Dr. Hany Gamal Metwally**, Lectuer of Vegetable crops, Faculty of Agriculture, Ain Shams University, for his valuble help and support

I would like to state clearly my great appreciation and respect to all the staff members of the Vegetable Handling Research Department Horticulture Research Institute especially

Finally, my gratitude to my **mother** and **father** and **brother's** for the continued assistance encouragement through this work.

CONTENTS

Page

1. INTRODUCTION……..... 1

2. REVIEW OF LITERATURE……..… 3

2.1 Effect of hot water treatments on reducing chilling injury and maintaining quality of sweet pepper fruits during cold storage ……..…….. 3

2.1.1 Physical characteristics …….. 3

2.1.2 Chilling injury …… 7

2.1.3 Chemical characteristics. .…….. 11

2.2 Effect of chitosan coating treatments on reducing chilling inju and maintaining quality of sweet pepper fruits during cold storage……. 12

2.2.1 Physical characteristics ……. 12

2.2.2 Chilling injury ……..….. 16

2.2.3 Chemical characteristics. …… 17

2.3 Effect of storage temperature on fruit quality of sweet pepper during storage…….……..... 19

2.3.1 Physical characteristics …… 21

2.3.2 Chilling injury …….. 23

2.3.3 Chemical characteristics. …… 25

3. MATERIALS AND METHODS…….……..…. 26

3.1 1-Effect of hot water treatments on reducing chilling injury and maintaining the quality of sweet pepper fruits during cold storage…… 26

3.2 2-Effect of chitosan coating treatments on reducing chilling injury and maintaining the quality of sweet pepper 27

fruits during cold storage…….. 28
3.3 3-Effect of hot water and chitosan treatments on reducing chilling injury and maintaining quality of sweet pepper fruits during cold storage…… …….. 28
3.3.1 Data recorded…… 29
3.3.2 Physical Characters…….. 29
3.3.3 Chilling injury ……. 29
3.3.4 Chemical Characters. ……. 29
3.3.6 Statistical Analysis ……..……. 29
4. RESULTS AND DISCUSSION…..…….. 96
Effect of hot water and chitosan treatments and storage temperatures on quality attributes of sweet pepper fruits during storage. 120
4.1.1. Physical Characters…… 127
4.1.2.ChemicalCharacters……
5. SUMMERY AND CONCLUSION……
6. REFERENCES…….
7. ARABIC SUMMERY……. …

LIST OF TABLES

Table No.
Page

Table (1): Effect of hot water, chitosan treatments and storage temperature on weight loss of sweet pepper fruits (Testy red F_1 Hybrid) during cold storage……. 36

Table (2): Effect of hot water, chitosan treatments and storage temperature on decay of sweet red pepper fruits (Testy red F_1 Hybrid) during cold storage…. 44

Table (3): Effect of hot water, chitosan treatments and storage temperature on gloss of sweet red pepper fruits (Testy red F_1 Hybrid) during cold storage ……. 52

Table (4): Effect of hot water, chitosan treatments and storage temperature on shriveling of sweet red pepper fruits (Testy red F_1 Hybrid) during cold storage …… 60

Table (5): Effect of hot water, chitosan treatments and storage temperature on fruit texture (p/En^2) of sweet pepper fruits (Testy red F_1 Hybrid) during cold …… 70

Table (6): Effect of hot water, chitosan treatments and 79

storage temperature on pitting of sweet pepper fruits (Testy red F_1 Hybrid) during cold storage in 2011/2012and 2012/2013 seasons ……. 87

Table (7): Effect of hot water, chitosan treatments and storage temperature on calyx darkening of sweet pepper fruits (Testy red F_1 Hybrid) during cold storage. in 2011/2012and 2012/2013 seasons …… 95

Table (8): Effect of hot water, chitosan treatments and storage temperature on seed darkening of sweet pepper fruits (Testy red F_1 Hybrid) during cold storage in 2011/2012and 2012/2013 seasons …….. 103

Table(9): Effect of hot water, chitosan treatments and storage temperature on total soluble solids % of sweet pepper fruits (Testy red F_1 Hybrid) during cold storage in 2011/2012 and 2012/2013 seasons…….. 111

Table(10): Effect of hot water, chitosan treatments and storage temperature on carotenoids content (mg / 100 g fresh weight) of sweet pepper fruits (Testy red F_1 Hybrid) during cold storage in 2011/2012and 2012/2013 seasons ……. 118

Table(11): Effect of hot water, chitosan treatments and storage temperature on ascorbic acid content of sweet pepper fruits (Testy red F_1 Hybrid) during cold storage in 2011/2012and 2012/2013 seasons……

LIST OF FIGURES

FIGURES No.

Page

Fig (1): Effect of hot water treatments on weight loss (%) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2011-2012 season……. 30

Fig (2):Effect of hot water treatments on weight loss(%) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period, in 2012-2013 season……. 30

Fig (3): Effect of chitosan treatments on weight loss (%) of sweet red pepper fruits (Testy red F1 Hybrid) duiring storage period,in 2011-2012 season…… 32

Fig (4): Effect of chitosan treatments on weight loss (%) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2012-2013 season…….. 32

Fig (5): Effect of different storage temperatures on weight loss(%) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period, in 2011-2012 season…….. 34

Fig (6): Effect of different storage temperatures on weight loss (%) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period, in2012-2013 season…… 34

Fig (7): Effect of hot water treatments on decay(score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2011-2012 season …….. 38

38

ig (8): Effect of hot water treatments on decay (score) of sweet red pepper fruits(Testy red F_1 Hybrid) duiring storage period,in 2012-2013 season ……. ……. 40

Fig (9): Effect of chitosan treatments on decay(score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2011-2012 season …… 41

Fig (10): Effect of chitosan treatments on decay (score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2012-2013 season …… 42

Fig (11): Effect of different storage temperatures on decay (score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period, in 2011-2012 season…… 42

Fig (12): Effect of different storage temperatures on decay (score)

of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period, in2012-2013 season…… 46

Fig (13): Effect of hot water treatments on gloss (score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2011-2012 season …… 46

Fig (14): Effect of hot water treatments on gloss (score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2012-2013 season..……. 48

Fig (15): Effect of chitosan treatments on gloss (score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2011-2012 season ……. 48

50

Fig (16): Effect of chitosan treatments on gloss (score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2012-2013 season ……. 50

Fig (17): Effect of different storage temperatures on gloss (score) of sweet red pepper fruits (Testy red F_1Hybrid) duiring storage period ,in 2011-2012 season……. 54

Fig (18): Effect of different storage temperatures on gloss (score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period, in 2012-2013 season…… 54

56

Fig.(19): Effect of hot water treatments on shriveling (score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2011-2012 season.…… 56

Fig (20): Effect of hot water treatments on shriveling (score) of

sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period, in 2012-2013 season.……... 58

Fig (21): Effect of chitosan treatments on shriveling (score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2011-2012 season …… 58

Fig (22):Effect of chitosan treatments on shriveling (score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period, in 2012 – 2013 season …… 63

63

Fig (23): Effect of different storage temperatures on shriveling (score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period , in 2011 -2012 season…….. 65

Fig (24): Effect of different storage temperatures on shriveling (score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period ,in 2012-2013 season……. 65

Fig (25): Effect of hot water treatments on fruit texture (p/En²) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2011-2012 season….…… 67

Fig (26): Effect of hot water treatments on fruit texture (p/En²) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2012-2013 season.…...……. 67

73

Fig (27): Effect of chitosan treatments on fruit texture (p/En²) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2011-2012season.……... … 73

Fig (28):Effect of chitosan treatments on fruit texture (p/En²)of 75

sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2012-2013 season.…… 75

Fig (29): Effect of different storage temperatures on fruit texture (p/En^2) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2011-2012 season…… 77

Fig (30): Effect of different storage temperatures on fruit texture (p/En^2) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2012-2013 season…… 77

Fig (31):Effect of hot water treatments on pitting (score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2011-2012 season…… 81

81

Fig (32): Effect of hot water treatments on pitting (score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2012-2013 season…… 83

Fig (33): Effect of chitosan treatments on pitting (score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2011-2012 season…… 83

Fig (34): Effect of chitosan treatments on pitting (score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2012-2013 season…… 85

Fig (35): Effect of different storage temperatures on pitting (score) of sweet red pepper fruits (Testy red F_1 Hybrid) duiring storage period,in 2011-2012 season.…….. 85

89