SUMMARY

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The experiments were performed in Agriculture Botany Dept., Fac. of Agriculture, Benha Univ. during summer seasons of 2004 and 2005, as well as the field experiment was conducted at the farm of Agriculture Botany Dept., during subsequent successive winter seasons of 2005 and 2006.

The aim of this study is to prolong the period of storage of potato tubers and to increase potato disease resistance through elongation of dormancy period. Also, to minimize sprouting ability and maintaining the bud viability as well as preventing weight reduction. . Some of extracted of essential oils from eucalyptus, fennel, anise, Thyme and the combination between them (eucalyptus+ anise, eucalyptus+ fennel, eucalyptus+ thyme, anise+ fennel, anise+ thyme, fennel+ thyme, eucalyptus+ anise+ fennel, eucalyptus+ anise+ thyme, eucalyptus+ fennel+ thyme, anise+ fennel+ thyme and eucalyptus+ anise+ fennel+ thyme) were used to study their effects on potato tubers storage compared with untreated potato tubers and storing in refrigerator at 4°C.

Potato tubers of Spunta cv. were obtained from Maba Company. The experiment was included 17 treatments, each treatment had 3 replicates. All tubers were treated by soaking for 3 mints. at concentration of different essential oils (1.5ml/L). Treated tubers were placed in cardboard boxes (5 Kg were placed in each box) and placed in storage room for 6 months.

After the end of the period of storage at the beginning of November, all potato seed stored tubers of different treatments and that of 4°C cold storage were used for plantation in the field in two years to study the effects of all treatments on vegetation growth, yield, its components and chemical composition.

As a separate experiment was conducted to study the effect of oils treatments (eucalyptus, anise, fennel and thyme) and also the effect of salt treatments sorbate, benzoate, carbonate and acetate sodium compared the control (untreated tubers) to increase resistance to dry rot disease caused by *Fusarium spp.*

Results obtained from this investigation could be summarized as following:-

1-Storage experiment:

A-Effect of different treatments on vegetative characteristics during storage:-

1- The best treatments were anise, fennel followed by eucalyptus treatments which considerably reduced weight loss%.

2- The tuber length and diameter of different treatments decreased by increasing the storage period.

3- The best treatments which considerably reduced number of sprouted eyes were eucalyptus+ fennel+ thyme oils followed by the combinations between anise + fennel + thyme, eucalyptus+ anise + fennel + thyme oils and eucalyptus+ anise + fennel oils.

4- The best treatments which considerably reduced sprouting% were the treatments of eucalyptus+ fennel +thyme, anise+

fennel, eucalyptus+ anise +fennel +thyme, and eucalyptus+ anise + fennel oils.

5-All treatments of essential oils and combination between them were significantly reduced sprout length compared with the control and refrigerator treatments. The best treatments which considerably reduced sprout length was anise + fennel. and The best ones which reduced sprout diameter were anise and fennel oils applied separately followed by thyme, anise+ fennel and fennel + thyme treatments in 2004 season and eucalyptus + fennel + thyme, anise + fennel, fennel, anise and eucalyptus + anise + fennel treatments in 2005 season.

6- All treatments of essential oils and combination between them decreased sprout fresh weight compared with the control. Also, the control treatment gave less sprout dry weight of each the refrigerator and other treatments in the two assigned seasons.

B-Chemical analysis:-

1-The most treatments of essential oils, combination between them and refrigerator significantly increased total carbohydrate in all storage periods compared with the control (untreated tubers) except the eucalyptus + anise+ thyme, anise, eucalyptus+ anise, thyme, anise+ thyme and refrigerator treatments in first storage period.

2-All treatments of essential oils and combination between them were significantly decreased reducing, non-reducing and total sugars compared with the control and refrigerator treatments in all storage periods.

3-All treatments of essential oils and their combinations significantly increased in polysaccharides and starch compared with the control and refrigerator treatments.

4- The minerals percentage (N, P and K %) were decreased in all treatments with increasing storage period i.e., 60, 120 and 180 days in two seasons.

II-Field experimental:-

A- Vegetative growth:-

1- The best treatments which considerably increased number of branches/plant were anise + Thyme followed by eucalyptus +anise + fennel, eucalyptus + fennel, eucalyptus and fennel+ thyme oils compared with the control.

2- Most treatments caused an increase in branch length of potato plants compared with the control ones. The highest increase was obtained by the use of anise, eucalyptus, refrigerator, and eucalyptus + anise arranged in descending order.

3- The best treatments which considerably increased number of leaves/plant anise, refrigerator, eucalyptus +fennel, eucalyptus, eucalyptus + thyme and finally eucalyptus +anise +fennel oils.

4- Anise and fennel oils, respectively were the treatments in which significantly induced the highest values of leaf area (cm^2) / plant.

5- The best treatments which considerably increased the fresh weight per plant were eucalyptus, fennel, refrigerator, eucalyptus +fennel, anise and eucalyptus + anise+ thyme.

6- Also, anise, fennel and eucalyptus+ fennel treatments, respectively were the treatments which significantly induced the highest values of plant dry weight.

B- Yield and yield components:-

1- Most treatments of essential oils and their combination were found to increase the number of tubers produced per plant.

2- The highest increase in the fresh weight of tubers produced per plant was reported by the treatments of eucalyptus+ fennel, anise, fennel, thyme, eucalyptus+ anise and eucalyptus+ anise + fennel + thyme oils.

3- All treatments of essential oils and their combinations were significantly increased tubers total yield kg/ plot and tubers total yield ton/ feddan compared with the refrigerator and control treatments of potato tubers.

4- The best treatments of the best superior effect on economical and biological yields of winter potato in comparison with treatments of cold stored potato seeds and others were those of potato seeds stored using treatment of anise oil followed by eucalyptus+ fennel, fennel and eucalyptus+ anise+ fennel+ thyme oils.

C- Chemical analysis:-

1- Anise oil treatment gave the highest value of total carbohydrates.

2- All treatments of essential oils and their combinations were significantly increased total sugar, polysaccharides and starch were increased compared with the control and the refrigerator treatments.

III- Pathological experiment:

1-The associated fungi of potato tubers dry rot were isolated and identified as *Fusarium oxysporum, Fusarium smitectium, Fusarium sambucinum Fusarium culmorum, Fusarium equista, Fusarium solani* and *Alternaria sp.*

2-Pathogenicity test: exhibited the responsibility of the isolated fungi of potato tubers dry rot disease. *Fusarium Sambucinum* and *Fusarium Solani* were the most destructive fungi causing the highest percentage of infected tubers. While, other fungi gave the lowest percentage of infected potato tubers.

3- Eucalyptus and anise oils were the best essential oils in inhibiting the linear growth, meanwhile fennel and thyme oils were less effective of essential oils on tested fungi-linear. Also, growth of isolates were mostly decreased of with increasing concentration.

4- Sodium sorbate and Sodium benzoate caused the highest decrease in mycelia growth. However Sodium carbonate and Sodium acetate were less effective salts.

5- Eucalyptus and anise oils were the best of essential oils for increasing the dry rot resistance. Meanwhile, fennel and thyme oils were less effective oils.

6- Sodium sorbate and Sodium benzoate were the most effective salts on potato tuber dry rot disease. As it reduced percentage of disease incidence and disease severity. On the other hand, Sodium carbonate and Sodium acetate were the least of effective salts.