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EFFECT OF PRE-HARVEST SPRAYING WITH SEAWEED EXTRACT "ACADIAN" AND ACTIVE DRY YEAST ON "LE CONTE" PEAR (*Pyrus leconte*, REHD) FRUIT QUALITY AND COLD STORABILITY.

BY

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ABSTRACT

This work was carried out during two successive seasons (2003 and 2004). "Le Conte " pear trees were sprayed nearly 60 or 30 days before harvest with 0.5; 1.0 and 1.5% concentrations either by seaweed extract "Acadian" or active dry yeast, in addition to the control trees. Fruit physical and chemical properties were analyzed during fruit growth and maturation. At the harvest date, fruit samples for all pre-harvest treatments were sorted, washed and stored at 0 ° C. and 90-95% R. H. up to 15 weeks.

Pre-harvest spraying with either seaweed extracts or active dry yeast significantly increased pear fruit weight; firmness; total soluble solids and total acidity contents while the fruit colour transition from green to yellow was delayed.

Also, spraying with seaweed extracts or active dry yeast significantly increased N. and P. contents of the leaves in the same period.

Seaweed extracts significantly increased pear fruit weight and firmness and N. content of the leave compared with the other treatments while active dry yeast significantly increased P. content of leaves. Also, this investigation confirmed that, effectiveness of those treatments was increased with increasing the used concentration.

Pre-harvest spraying with seaweed extract and active dry yeast also significantly reduced pear fruit weight loss and decay percentage incidence during storage. Also those treatments reduced the deterioration of fruit firmness and transition of fruit colour during storage, while had no clear effect on other fruit properties during storage, such as the contents of T. S. S. and acidity.

In addition, this study confirmed that, seaweed extract and active dry yeast has the same effect on reducing weight loss of pear fruit during storage, while the latter (active dry yeast) was superior in reducing pear postharvest decay incidence.

INTRODUCTION

"Le Conte" (*Pyrus leconte*, Rehd), the most important pear cultivar in Egypt, it's orchards occupy about 7557 feddans with total fruit production of about 35441 tons according to the statistics of Ministry of Agriculture, Egypt (2003).

Bio-fertilizers are very safe for human, animal and environment (Sorial and Abd El-Fattah, 1998) and found to increase growth, fruiting and quality of many horticultural crops (Atawia and El-Desouky, 1997, on Washington navel orange; Mansour, 1998, on apple; Ahmed, *et al.*, 2000, on grape; Abdel-Hameed, 2002, on olive and Osman, 2003, on date palm).

It has been reported that, several nitrates inhibited the antagonistic capability of *C. guillermondii* significantly, thus suggesting the competition for nitrogen should play a major role in the bio-control activity of the antagonistic yeast (Scherm, *et al.*, 2003).

Understanding the mode of action of the antagonist is important to identify useful traits that could be upgraded to genetic tools. Mechanisms which have been reported to play a role in the bio-control activity of antagonistic yeasts include competition of extracellular depolymerases which putatively act on pathogen cell walls (Droby, *et al.*, 1989; Wilson and Wisniewski, 1989 from Castoria,*et al.*, 2003; Droby and Chalutz, 1994; Arras, *et al.*, 1998; Castoria,*et al.*, 2001; and Janisiewicz and Korstn, 2002).

While several studies had demonstrated the potential bio-control of postharvest disease when applied after harvest, few have addressed the practically applied bio-control agents to the fruit while in the field with the purpose of controlling postharvest decays (Spotts and Goyal, 1997).

Benbow and Sugar, 1999 reported that, the yeasts (*Cryptococcus infirm-miniatus*, *C. Laurentii* and *Rhodotorula glutins*) applied to "Bosc" and "d'Anjou" pear fruit in the field 3 weeks prior to harvest maintained high population of yeast levels through harvest and controlled postharvest decay in fruits.

It has been reported that, there was a reduction of blue mold incidence in apples treated 2 days before harvest with candida sake strain (Teixido, *et al.*, 1998).

The mechanisms by which yeast bio-control agents provide decay control are not fully understood. However, there is evidence that, the mode of action of several yeast species used as bio-control agents does not involve antibiosis but rather competition for nutrients at the wound site (Goyal and Spotts, 1996 and Droby and Chalutz, 1994).

Atawia and El-Desouky (1997) reported that, active dry yeast spray on Washington navel orange trees significantly increased fruit number and yield per

tree; fruit weight; total soluble solids contents of fruits; T. S. S. / Acid ratio ascorbic acid contents of fruits at harvest. They added that, the used treatments significantly increased leaf N. P. and K. contents compared with control. The same results were concluded by Hegab, *et al.*, (1997) on Valencia orange; Mansour (1998) on apple and El-Sharkawy and Mehaisen (2005) on Guava.

On the other side, these treatments significantly decreased fruit firmness and total acidity (Ahmed, *et al.*, 2000 on grape; Abdel-Moniem, *et al.*, 2002 on Annona and El-Sharkawy and Mehaisen, 2005 on Guava).

On contrast, it has been reported that, field applications of various antagonists including yeast from bloom till harvest have variable success. Less variable results were obtained in controlling fruits decay in greenhouse strawberry culture, and antagonists on flowers and fruit remained at higher and more stable populations under controlled greenhouse conditions (Lima, *et al.*, 1997 from Janisiewicz and Korstn, 2002).

Spadaro, *et al.*, (2002) reported that, Golden delicious apple in a suspension of 10^7 antagonists (four isolates of the yeast) cells per ml. and storing for 8 months in controlled atmosphere at 1° C, showed levels of control against *B. canerea* and *P. expansum* similar to those from thiwabendazole. Sugar, *et al.*, (2003) reported that, application of the yeast "*Cryptococcus infirm-miniatus*" to pear fruit one week before harvest at a concentration 1 5 × 10to $1.^8$ C. Fu. / ml. resulted in establishment of large population of yeast on fruit surfaces, but didn't reduce postharvest fungal decay incidence in 3 years of testing.

It has been reported that, seaweed extract has been used as food, fertilizer and for medicinal purposes for a long time, like other plants, seaweed contain various kinds of inorganic and organic substances which probably benefit human health. It has been reported that seaweed contain high levels of minerals, vitamins, essential amino acids, indigestible carbohydrates, and dietary fiber (Jimenez-Escrig and Goni, 1999) from (Ismail and Hong, 2002).

The use of bio-fertilizers is an alternative to improve the conditions of world-wide fields. Biological fertilizers don't contaminate the soil and atmosphere, and help to produce healthy food (Blunden, 1973 from Sanchez, *et al.*, 2003). Seaweed and their derivatives are used in agriculture as potential growth regulators.

Seaweed extract have been reported to increase plant resistance to pests and diseases, plant growth, yield and quality (Yvin, *et al.*, 1989; Jolivet, *et al.*, 1991 and Verkleij, 1992 from Fornes, *et al.*, 2002).

There are few reports describing the response of fruit species to seaweed extracts. An increase in citrus yield was reported by Koo (1988) from Fornes, *et al.*, (2002). The application of a seaweed extract increased the sugar content and decreased the acidity in the juice of Navel orange and of Satsuma and Clementine

mandarins (Fornes, *et al.*, 1995 and Fornes, *et al.*, 2002), but did not in the juice of Valencia orange or Sunburst tangerine, (Koo, 1988 and Jensen, 2004).

The use of seaweed as a growth stimulator is widely supported by scientific studies. There is also some evidence supporting the idea that, seaweed extracts are useful in helping plants through times of stress, including drought, disease and cold weather (Jensen, 2004). Also he added that, in a study done by Acadian (sea plants extract, two varieties of grapes were treated with a foliar spray at critical times such as pre-bud break, pre-bloom, post-bloom and sizing stage. At the most optimal concentration, there was a 24% yield increase over the control and also an increase in size and firmness. However, Brix levels tended to be slightly lower in treated grapes. Similar results were obtained on plum trees, cherries, apricots and peaches (Jensen, 2004).

El-Ansary and El-Morsy (1997) in their study on Washington navel orange trees were sprayed with seaweed extract at 0, 1, 2 and 4 ml. /liter either one or two sprays during growing season. They reported that, seaweed extracts reduced T.S.S. content and T. S. S. /Acid ratio of Washington navel orange fruits at the picking date in comparison with the non-sprayed ones.

This effect was also presented through the storage. Also they added that, reduction of T. S. S. and T. S. S. / Acid ratio were increased generally as the concentration of seaweed extract increased in one spray treatment. Moreover, trees sprayed twice generally showed significant increment in T. S. S. reduction. Also they added that, two sprays increased fruit acidity significantly than once at the same concentration.

They also added that seaweed extract used with different concentrations, generally increased weight loss percentage and reduced decay incidence of the fruits during storage. This effect was increased with the increment of either the concentration of the seaweed extract or the number of sprays.

El-Abbasy and El-Morsy (2002) in their study on Thompson seedless grape, Vineyards were sprayed with seaweed extracts at 4 ml. / liter after full bloom and / or at version. They reported that, soluble solids contents at harvest were increased while total acidity decreased significantly by using two sprays of seaweed extract treatment. They also added that, these pre-harvest treatments significantly increased T. S. S. / Acid ratio; shattering and decay during cold storage. Also, they mentioned that, two sprays of seaweed extract significantly increased weight loss and decay during storage compared with one spray and control (unsprayed vines).

It has been reported that, the fruit yield increased as the concentration of the seaweed extract increased (Fornes, *et al.*, 2002).

Seaweed extracts and fungal agent's yeasts were compared for the control of fruit rots in strawberries in 5 field trails in Victoria, Australia. All treatments were applied as foliar sprays at weekly intervals. Seaweed extracts and

yeast treatment significantly reduced gray mould during the 3 days storage at room temperature (15 -25 °C) after harvest (Washington, *et al.*, 2004).

The purpose of this study is to determine the effect of foliar spraying with two bio-fertilizer compounds (Acadian and Yeast) on pear fruit quality at harvest and during cold storage.

MATERIALS AND METHODS

This investigation was carried out during the two successive seasons (2002 and 2003) at Horticulture Research Institute, Giza Governorate, Egypt.

Fruit samples were taken from a private farm at Ashmoun, Minufia Governorate. Pear trees were 5 years old, planted in a loomy soil at 3.5 × 3.5 grafted on MM. 106 rootstock and subjected to all agriculture practices as Ministry of Agriculture recommendation. During May in 2003, 39 healthy, nearly uniformed trees in growth vigor were selected for this study. 18 trees for Acadian and another 18 trees for the active dry yeast treatment, half of the trees were sprayed once nearly at 60 days before the expected harvest day, and the other trees sprayed twice at 60 and 30 days before the expected harvest day, the last three trees were sprayed with water as a control treatment. There were 3 used concentrations (0.5; 1.0 or 1.5%) in this investigation. All treatments have three replicates, each replicate has one tree. All treatments were added as a foliar spray. Fruit samples were taken during growth development at the first; the second sprays and 15; 7 day's prior harvest and at harvest day to determine the effect of these biofertilizer treatments on fruit quality at harvest.

Mature fruits of each treatment in both seasons, were picked, washed, dried, sorted to obtain uniform samples then stored at 0°C. and R.H. 90- 95% up to 15 weeks. Each treatment had six carton boxes (each had 12 fruits), representing three replicates, were used for the determination of the physical and chemical properties at 3 weeks interval. Another three replicates were used to estimate the weight loss and decay percentage.

The determination procedures were as follow:

1-Weight loss percentage was calculated as the difference between fruit weight at the start of storage and fruit weight at the inspection date.

2-Percentage of discarded fruits including all the injured or spoiled fruits resulting from fungus or bacterial, shriveling and various invidious were calculated and expressed as decay percentage.

3-Fruit firmness was measured in 6 fruits (3 readings per each fruit) by Lfra texture analyzer instrument using a penetrating cylinder of 1 mm. in diameter to a constant distance 5 mm. inside the skin of fruits and by a constant speed 2 mm. per sec. and the peak of resistance was recorded per gm.

4-Peel color changes during growth and storage was estimated by a Hunter colorimeter type (Dp-9000) for the estimation of "L", "a" and "b" values and to evaluate color values as hue angle (hue angle = $\tan^{-1}$b\a). Hue angle (0° = red-

purple, 90° = yellow, 180° = bluish-green, 270° = blue) as described by McGuire, 1992 and Voss, 1992.

5-Percentage of total soluble solids (T.S.S. %) of the flesh was estimated by A'bbe digital refractometer, according to A.O.A.C., 1980.

6-Acidity percentage of the flesh was determined as citric acid by titration with a solution of 0.1 N., NaOH, according to A.O.A.C., 1980.

7-Leaf N., P. and K. content was determined in twenty leaves for each replicate, leaves were picked just after the first; the second sprays and at 15 and 7 days prior harvest and at harvest day, and washed, weighted, dried at 60°C in electric oven until constant weight was obtained. The determination procedures were as follow:

- Total nitrogen was determined by micro-kjeldahle method according to A.O.A.C., 1980
- Leaf P. content was determined as described by Wide, *et al.*, 1985.
- Leaf K. content was determined by Atomic Absorption spectrophotometer according to Chapman and Pratlt, 1978.

All data for all fruit parameters studied were analyzed as a complete randomized design with factorial treatments as described by Snedecor and Cochran, 1980.

RESULTS AND DISCUSSION

A- Effect of pre-harvest spraying with seaweed extract and dry active yeast on pear fruit development and maturation:-

1- Pear fruit physical properties:

Data presented in Fig.(1, 2, 3 & 4) clearly show that, regardless of preharvest treatments, pear fruit weight and lightness (L value) increased gradually and significantly while fruit firmness and hue angle (the representation of colour) decreased with the increasing of fruit age in both seasons of study.

Also, data clear that, all pre-harvest examined treatments (seaweed extract and active dry yeast) significantly increased pear fruit weight; firmness and hue angle (fruit colour representation) while had no effect on peel fruit lightness (L. value).

These results are in line with those reported by Koo (1988); Atawia and El-Desouky (1997); Hegab, *et al.*, (1997); Mansour (1988) and El-Sharkawy and Mehaisen (2005). They reported that, seaweed extracts and active dry yeast pre-harvest treatments significantly increased fruit weight and yield at harvest.

Also these results agree with those obtained by Jensen (2004) who reported that, Acadian pre-harvest spraying increased grape, cherries, apricots and peaches fruit firmness.

On contrast, these results disagree with the findings of Ahmed, *et al.*, (2000); Abd El-Moniem, *et al.*, (2000) and El-Sarkawy and Mehaisen (2005). They reported that, pre-harvest treatments with active dry yeast decreased fruit firmness at harvest.

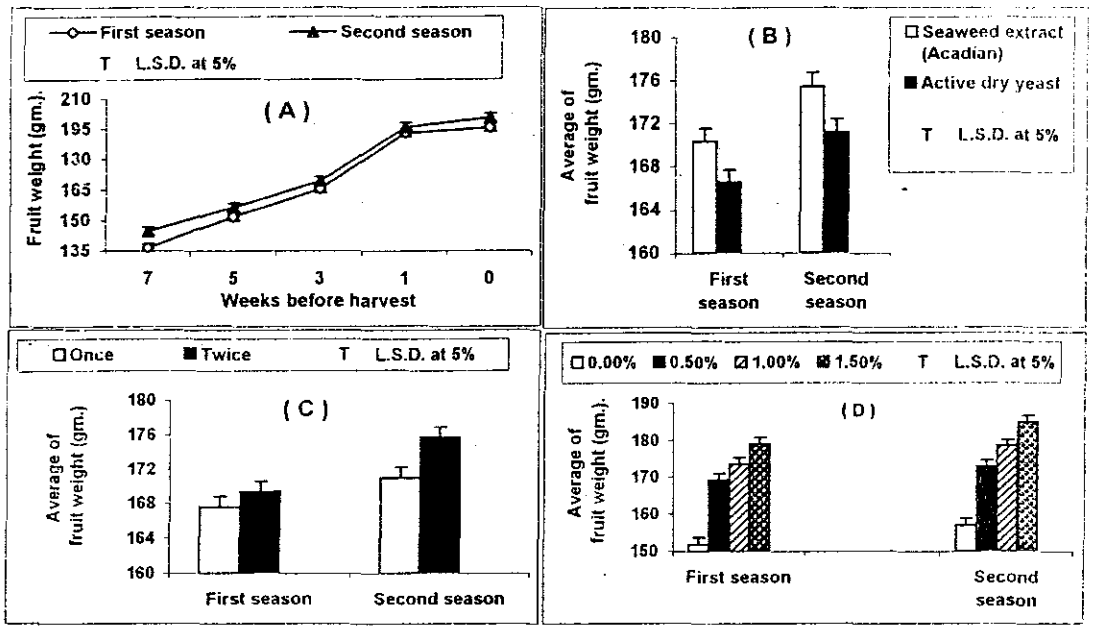

Fig. (1): Specific effect of fruit age (A), preharvest treatments(B) , number of spray (C) and concentrations of spray (D) on average weight of pear fruit during developmental stages and maturation.

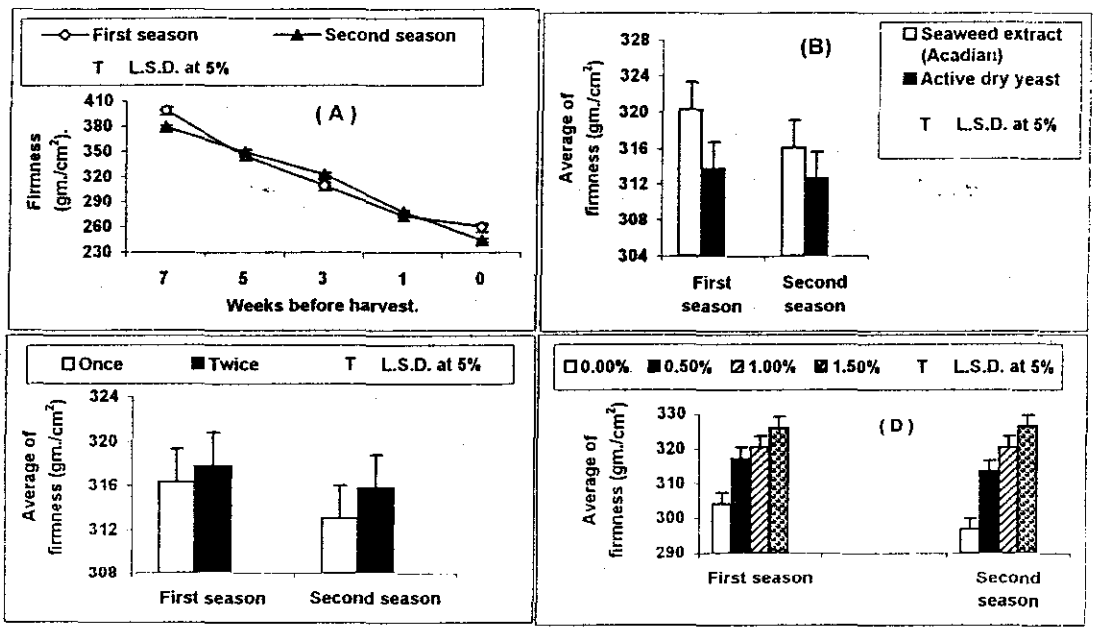

Fig. (2): Specific effect of fruit age (A), preharvest treatments(B) , number of spray (C) and concentrations of spray (D) on average of firmness of pear fruit during developmental stages and maturation.

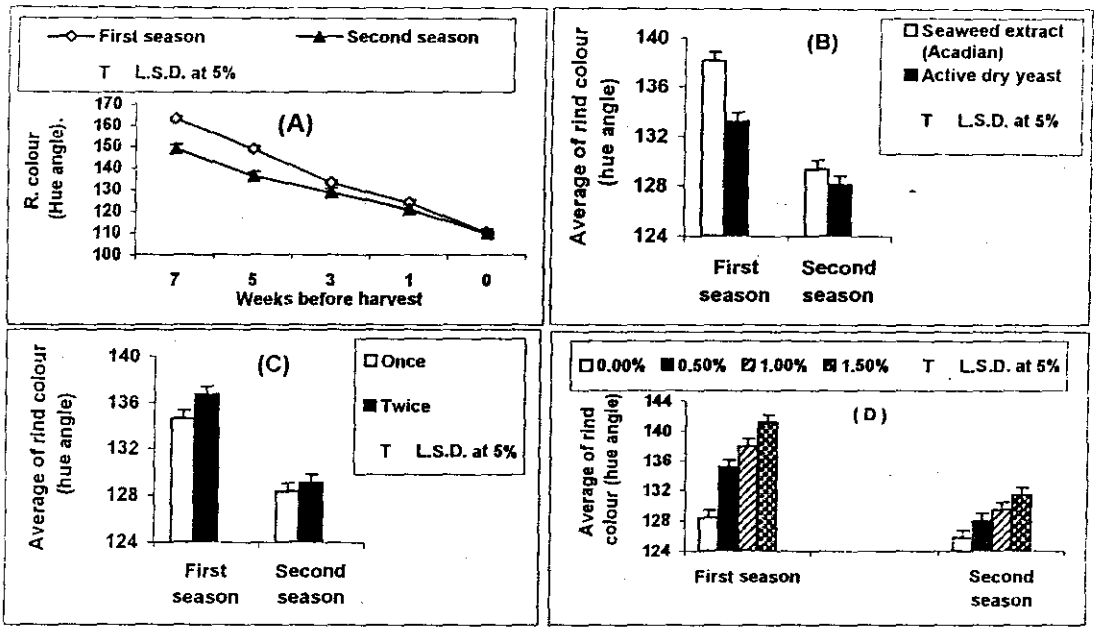

Fig. (3): Specific effect of fruit age (A), preharvest treatments (B) , number of spray (C) and concentrations of spray (D) on average of rind colour (hue angle) of pear fruit during developmental stages and

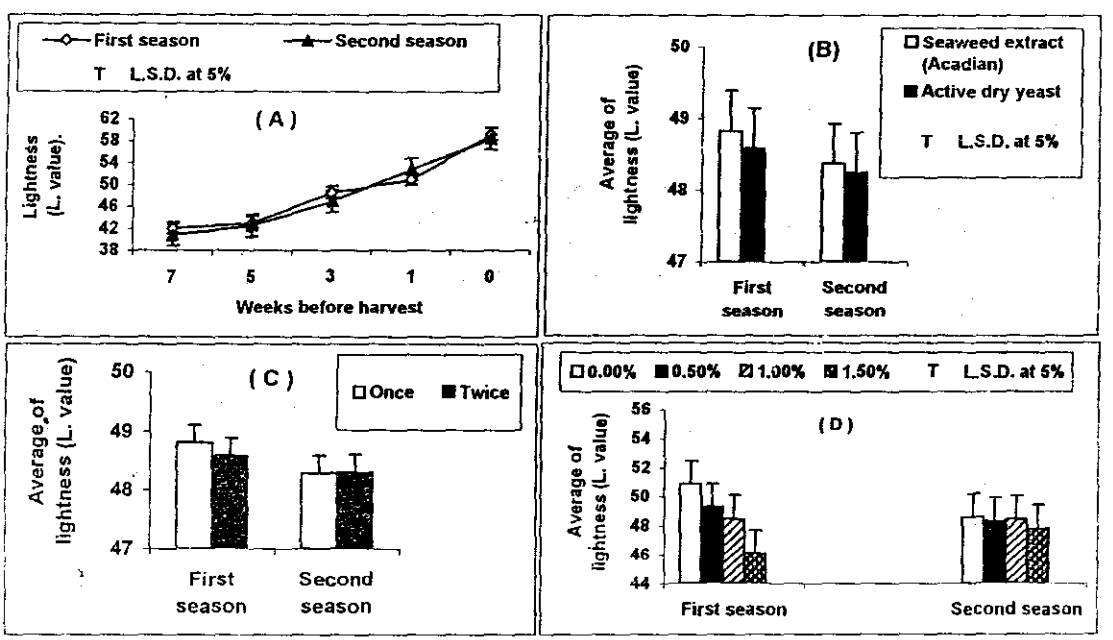

Fig. (4): Specific effect of fruit age (A), preharvest treatments(B) , number of spray (C) and concentrations of spray (D) on average of lightness (L. value) of pear fruit during developmental stages and

In this respect data also indicated that, seaweed extracts was more effective than dry active yeast. In addition, the effectiveness of these treatments was increased as the used concentration increased or as the spray repeated except fruit firmness.

Also data cleared that, there was a significant interactions between all the examined factors (the type of spraying compounds; the used concentrations and the number of sprays).

These results are in accordance with those reported by El-Ansary and El-Morsy (1997) and El-Abbasy and El-Morsy (2002). They reported that, the effect of pre-harvest spraying with seaweed extracts increased with the increasing of the used concentration. These results partly agree with those reported by El-Ansary and El-Morsy (1997).

2- Pear fruit chemical properties:

Data presented in Fig. (5 & 6) show that, total soluble solid contents of pear fruit increased gradually and significantly while total acidity contents decreased gradually and significantly till fruit reached maturity stage in two seasons.

Also data show that, pre-harvest spraying with either seaweed extract (Acadian) or active dry yeast significantly increased pear fruit total soluble solids and total acidity contents during fruit development and maturation compared with untreated ones (control). Also data indicated that, both seaweed extract (Acadian) and active dry yeast had the same effect on total soluble solid contents of fruit either sprayed only one time or repeated after one month.

These results are in line with those mentioned by Fornes, *et al.*, (1995); Atawia and El-Desouky (1997); Hegab, *et al.*, (1997); Mansour (1998); Fornes, *et al.*, (2002) and El-Sarkawy and Mehaisen (2005). They reported that, pre-harvest spraying with Acadian or active dry yeast significantly increased fruit total soluble solids contents at harvest.

On contrast, these results disagree with those obtained by by El-Ansary and El-Morsy (1997); Ahmed, *et al.*, (2000); Abd El-Moniem, *et al.*, (2000); Jensen (2004) and El-Sharkawy and Mehaisen (2005). They reported that, pre-harvest spraying with seaweed extract or active dry yeast decreased total acidity contents of fruits at harvest.

3- Pear leaves N., P. and K. contents:

Data in Fig. (7, 8 & 9) indicate that, leaf N. and P. contents increased gradually and significantly during fruit growth and maturation.

On the other side, there was no obvious trend for K. changes during the same period probably these treatments were nearly associated with the K. fertilization additives.

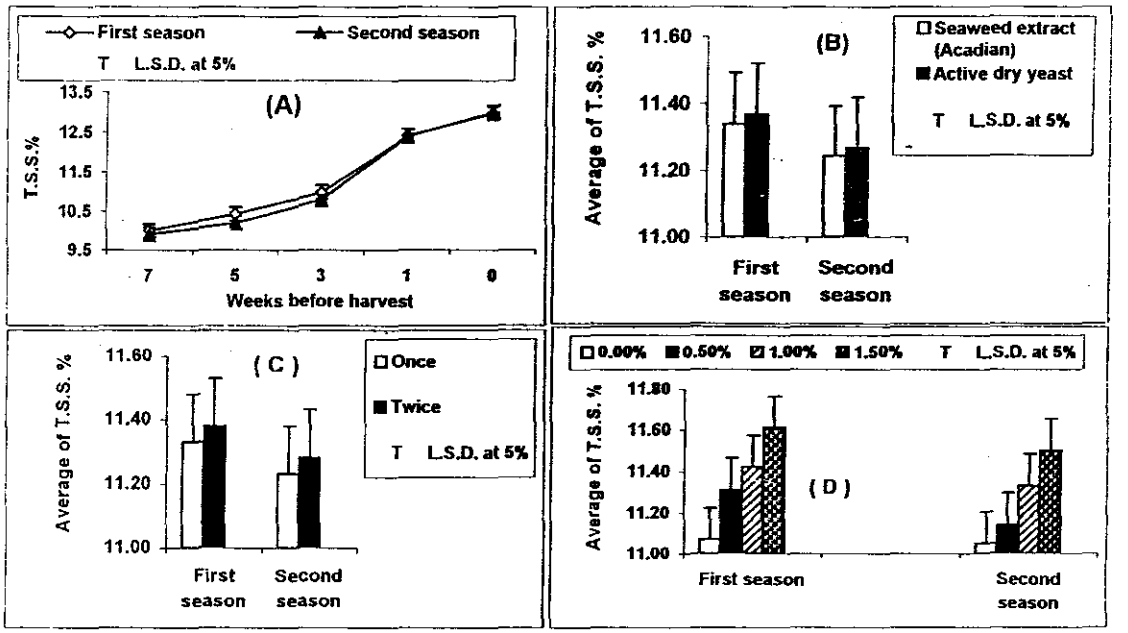

Fig. (5): Specific effect of fruit age (A), preharvest treatments(B) , number of spray (C) and concentrations of spray (D) on average of T.S.S.% of pear fruit during developmental stages and maturation.

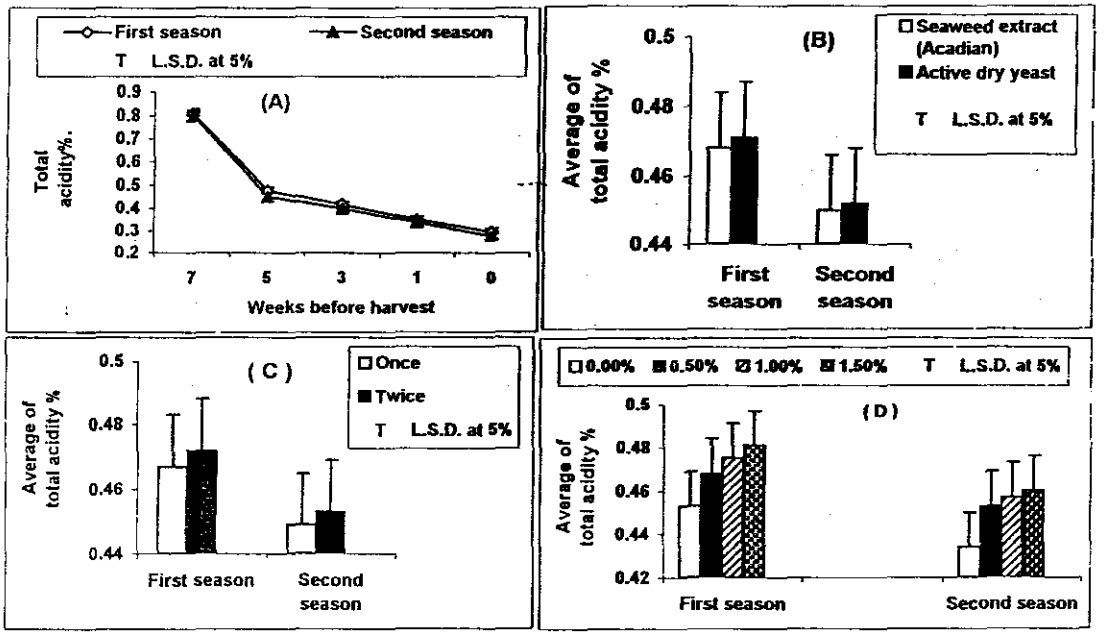

Fig. (6): Specific effect of fruit age (A), preharvest treatments(B) , number of spray (C) and concentrations of spray (D) on average of total acidity % of pear fruit during developmental stages and

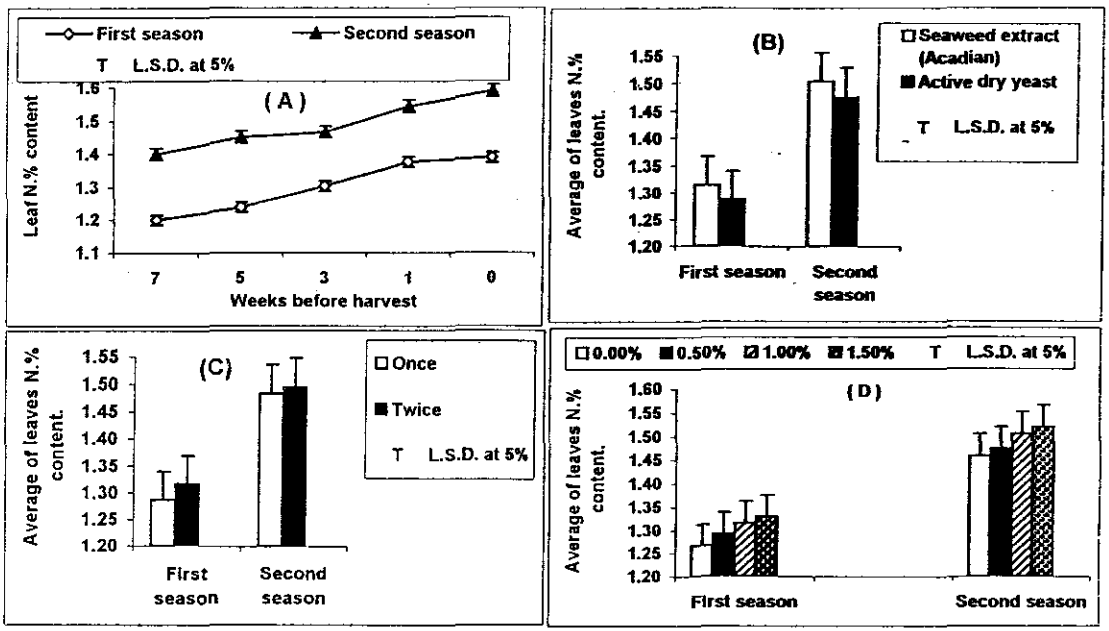

Fig. (7): Specific effect of fruit age (A), preharvest treatments(B) , number of spray (C) and concentrations of spray (D) on average of N.% of pear leaves during developmental stages and maturation.

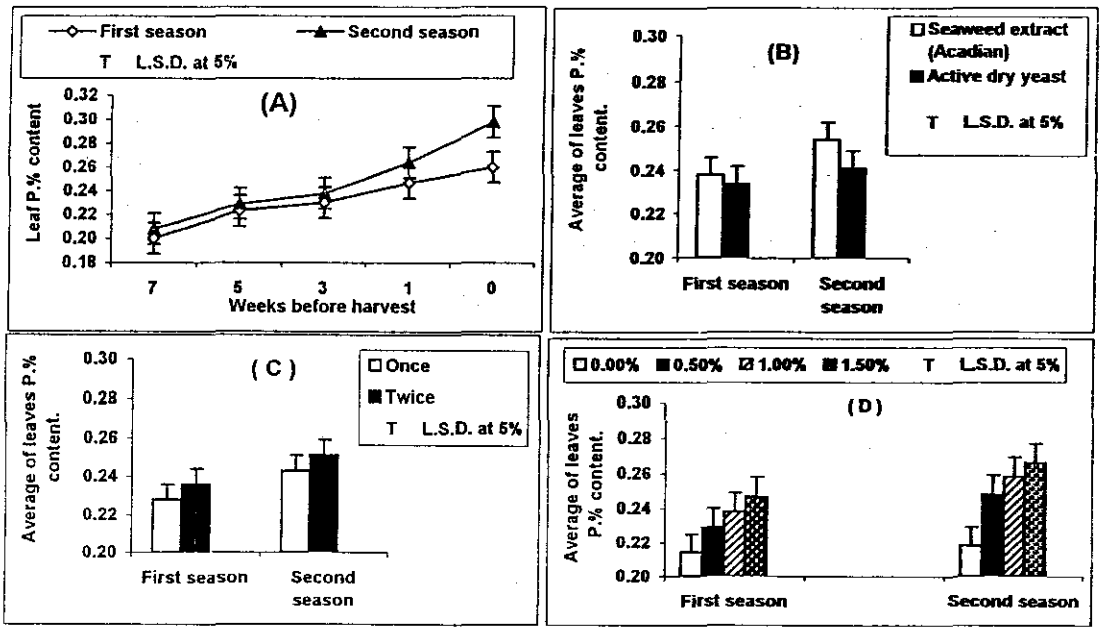

Fig. (8): Specific effect of fruit age (A), preharvest treatments(B) , number of spray (C) and concentrations of spray (D) on average of P. % of pear leaves during developmental stages and maturation.

In addition, data clearly indicate that, the seaweed extracts and the active dry yeast significantly increased leaf contents of N. and P. but had no effect on leaf content of K. Also data indicated that, seaweed extract and the active dry yeast had the same effect on leaf contents of N but seaweed extract was superior on active yeast in increasing leaf contents of P. during the two seasons of this investigation.

Concerning sprays number, data indicated that there were no significant differences between pear leaf contents of N. and K. either sprayed once or twice.

Pear leaf contents of N. and P. increased gradually and significantly with the increasing of the used concentration from both seaweed extract and active dry yeast.

These results are supported by the findings of Atawia and El-Desouky (1997); Hegab, *et al.*, (1997); Mansour (1998) and El-Sharkawy and Mehaisen (2005). They reported that, pre-harvest spraying with active dry yeast significantly increased leaves contents of N.; P. and K. during growth development.

B- Effect of pre-harvest spraying with seaweed extracts and dry active yeast on pear fruit storability:-

1- Pear fruit physical properties:

1-1. Weight loss and decay percentage:

Data presented in Fig. (10 & 11) show that, regardless of the pre-harvest treatment on pear fruit, weight loss and decay percentage increased gradually and significantly with prolonged storage in the two seasons of this work.

On the other hand, it is clear from data that, pre-harvest spraying with either seaweed extract or active dry yeast significantly decreased weight loss and decay incidence of pear fruit during storage in the two seasons in this study.

Data also indicated that, both pre-harvest spraying with seaweed extracts and active dry yeast had the same effect on reducing weight loss incidence of pear fruit during storage. While pre-harvest spraying with active dry yeast was more effective in reducing decay incidence of pear fruit during storage than pre-harvest treatments with seaweed extracts.

In addition, the effectiveness of these treatments increased significantly either with the increasing of the used concentration or repeated treatment in both the two used compounds (seaweed extract and active dry yeast) during the two seasons of this work.

These results are in harmony with those obtained by Lima, *et al.*, (1997); Teixido *et al.*, (1998), Benbow and Sugar (1999); Spadaro *et al.*, (2000). They reported that, pre-harvest yeast application reduced decay during storage. And partly agree with those reported by El-Ansary & El-Morsy (1997). They mentioned that, seaweed extracts significantly increased weight loss incidence of Navel orange fruits and decreased decay incidence during storage.

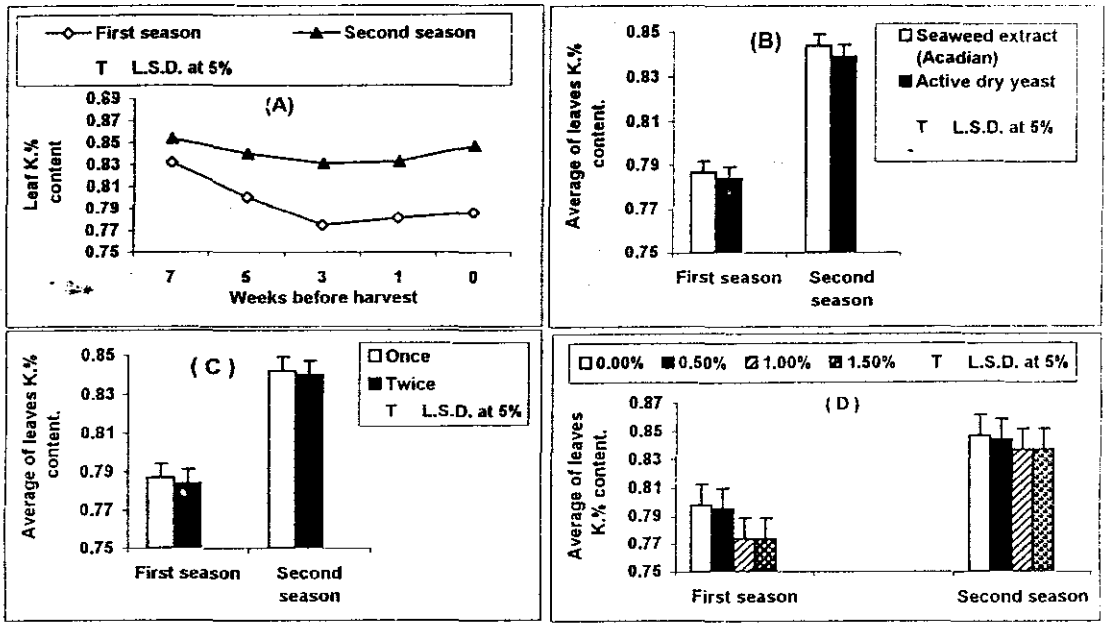

Fig. (9): Specific effect of fruit age (A), preharvest treatments(B) , number of spray (C) and concentrations of spray (D) on average of K. % of pear leaves during developmental stages and maturation.

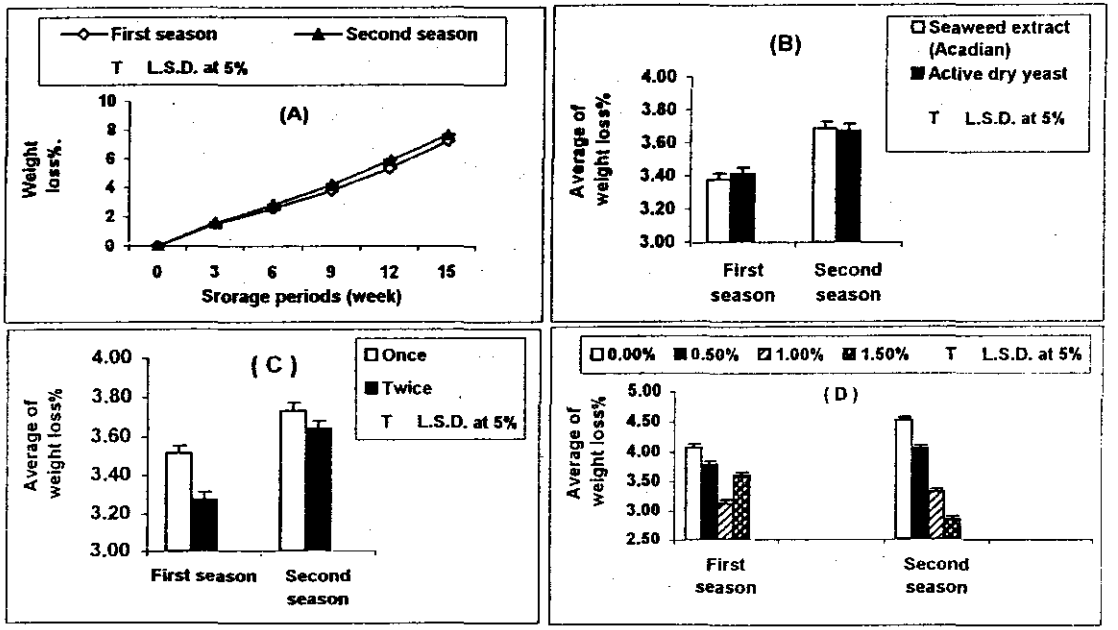

Fig. (10): Specific effect of storage periods (A), preharvest treatments(B) , number of spray (C) and concentrations of spray (D) on average of weight loss% of pear fruit during cold storage.

Also, these results disagree with those mentioned by Sugar, *et al.*, (2003) who reported that, spraying yeast on pear fruit one week before harvest didn't reduce fungal decay incidence during storage and those obtained by El-Abbasy and El-Morsy (2002) who reported that, pre-harvest spraying with seaweed extract significantly increased decay of grapes during storage.

Also, these results are in line with those findings of El-Abbsay and El-Morsy, (2002) who reported that pre-harvest treatment with the seaweed extract effect increased when sprayed two times before harvest compared with only once.

1-2- Fruit firmness, lightness and rind colour:

Data illustrated in Fig. (12, 13 & 14) cleared that, fruit firmness; colour (represented as hue angle) and lightness (L. value) decreased gradually and significantly with the extension of storage period in both seasons of this investigation.

It is clear from data that, pre-harvest spraying with seaweed extracts and active dry yeast significantly reduced the softening rate of pear fruit firmness and the changes rate of fruit colour (ripening) during storage in the two seasons of this investigation.

These results are in agreement with those obtained by Mehaisen (2005).

On the other side, these treatments significantly reduced pear fruit lightness during storage. However, this was probably due to pre-harvest period of these treatments which significantly showed less fruit lightness at harvest.

Data also indicated that, regardless of lightness which was not affected by the used concentrations or spraying numbers, pre-harvest spraying with seaweed extracts and active dry yeast was effective on reducing the deterioration rate of firmness and colour. In addition, these reductions increased gradually and significantly with the increasing of the used concentration or repeated spray in both the first and the second seasons in this study.

2- Pear fruit chemical properties:

-Total soluble solids and total acidity percentage:

It is clear from data shown in Fig. (15 & 16) that, total soluble solids increased gradually and significantly while total acidity decreased gradually and significantly with the prolonging of storage period in the two seasons of this investigation. These results are in line with those obtained by Mehaisen (2005).

Data obtained in the same Fig. show that, pre-harvest spraying with seaweed extracts and active dry yeast significantly increased total soluble solids while had no effect on total acidity during storage either treated once or twice.

It is also evident that, pear fruits treated with active dry yeast had significantly higher total soluble solids contents than those treated with seaweed extracts.

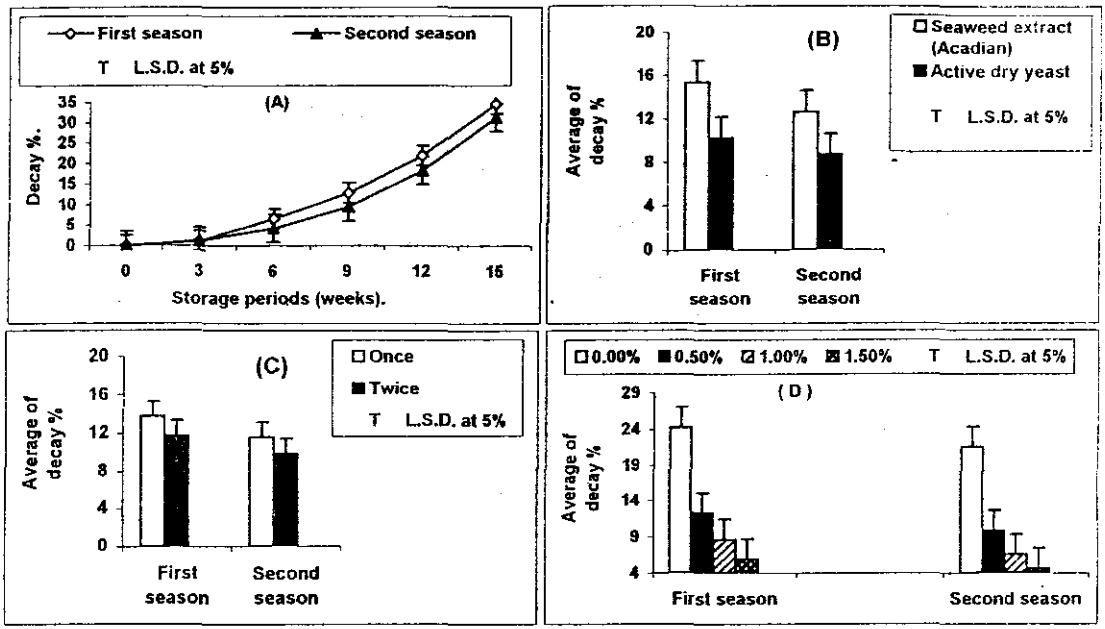

Fig. (11): Specific effect of storage periods (A), preharvest treatments(B) , number of spray (C) and concentrations of spray (D) on average of decay% of pear fruit during cold storage.

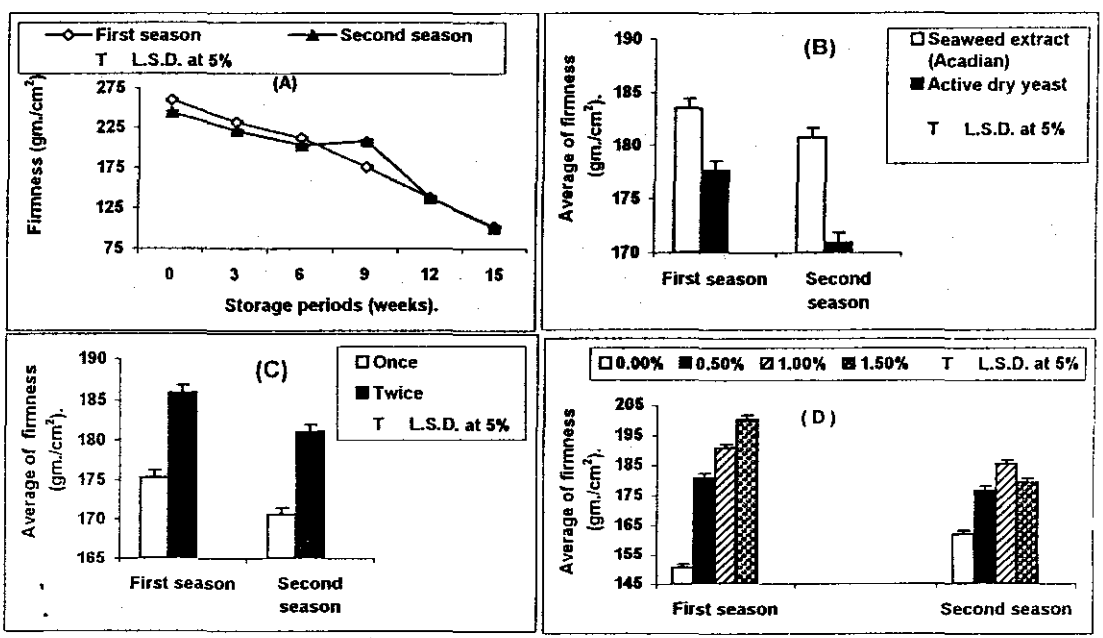

Fig. (12): Specific effect of storage periods (A), preharvest treatments(B) , number of spray (C) and concentrations of spray (D) on average of firmness (gm./cm^2) of pear fruit during cold storage.

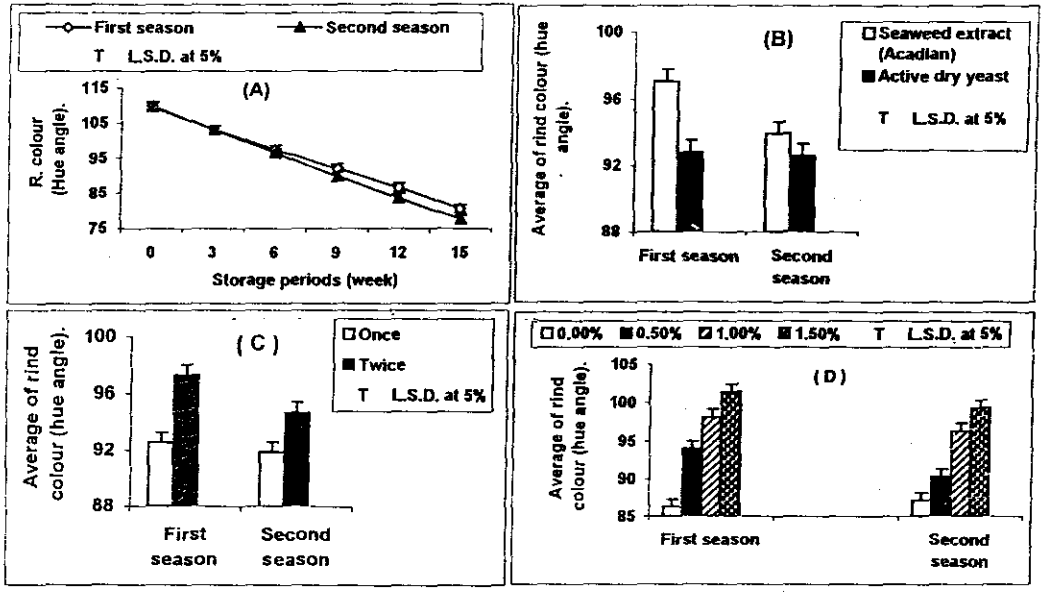

Fig. (13): Specific effect of storage periods (A), preharvest treatments(B) , number of spray (C) and concentrations of spray (D) on average of rind colour (hue angle) of pear fruit during cold storage.

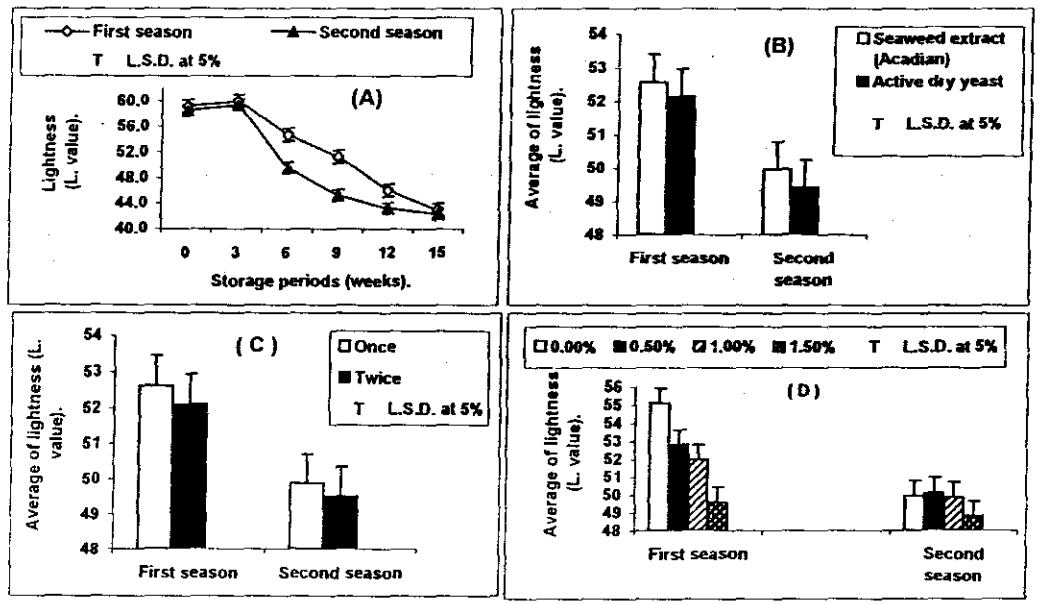

Fig. (14): Specific effect of storage periods (A), preharvest treatments(B) , number of spray (C) and concentrations of spray (D) on average of lightness (L. value) of pear fruit during cold storage.

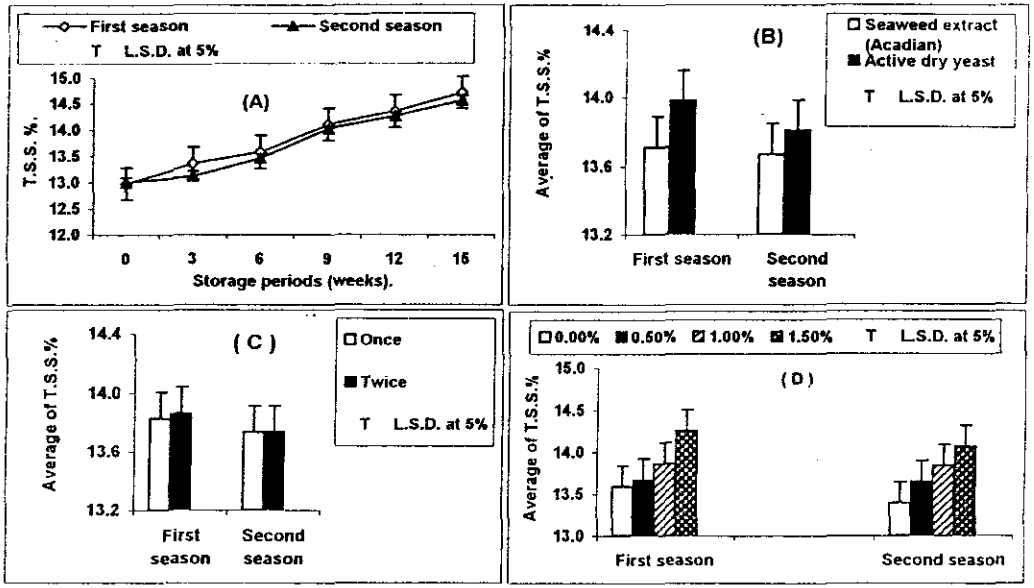

Fig. (15): Specific effect of storage periods (A), preharvest treatments(B) , number of spray (C) and concentrations of spray (D) on average of T.S.S.% of pear fruit during cold storage.

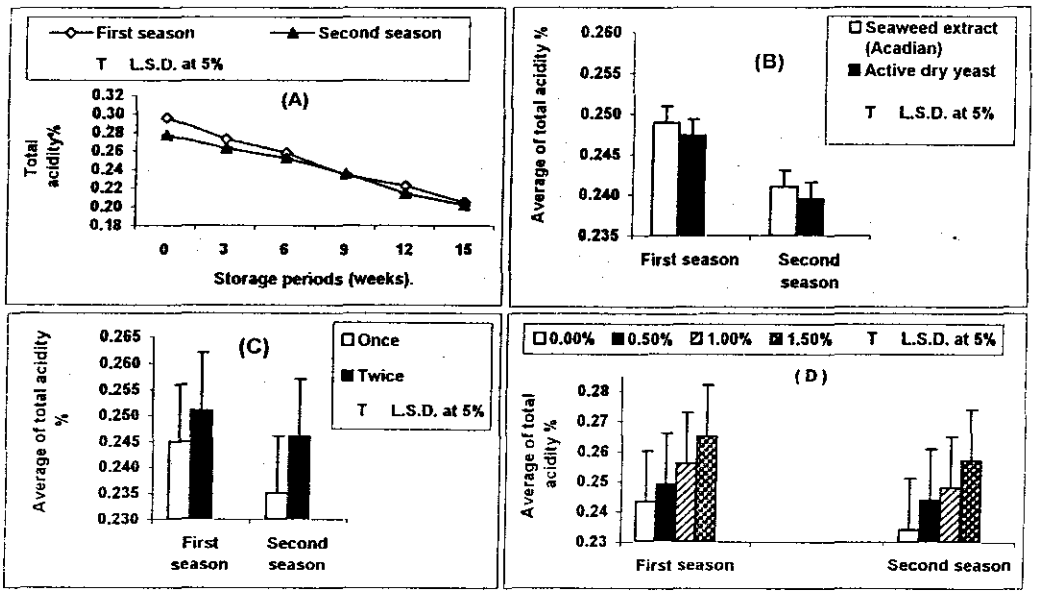

Fig. (16): Specific effect of storage periods (A), preharvest treatments(B) , number of spray (C) and concentrations of spray (D) on average of total acidity % of pear fruit during cold storage.

Also it is obvious that, effect of pre-harvest spraying with seaweed extracts and active dry yeast increased with the increasing of the used concentration in this respect while number of sprays had no effect on pear fruit total soluble solids contents during storage.

These results disagree with those mentioned by El-Ansry and El-Morsy (1997), they reported that seaweed extract spraying before harvest significantly reduced T.S.S. contents of grapes during storage.

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تأثير الرش بمستخلص الأعشاب البحرية والخميرةالجافة النشطة على خواص ثمار الكمثرى صنف "ليكونت" وقدرتها على التخزين المبرد.

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أجرى هذا البحث خلال موسمين متتاليين (٢٠٠٣ و ٢٠٠٤) ؛ حيث تم رش اشجار الكمثرى صنف "ليكونت" قبل موعد اكتمال النمو المتوقع بـ ٦٠ و ٣٠ يوماً بمستخلص الأعشاب البحرية أو الخميرة الجافة النشطة بتركيزات ٠,٥٪ أو ١ ٪ أو ١,٥٪ بالإضافة إلى رش اشجار الكنترول بالماء فقط.

تم دراسة خواص الثمار الطبيعية والكيماوية خلال مرحلة النمو والتطور وحتى وصول الثمار إلى درجة إكتمال النمو. عندئذ تم حصاد وغسيل وفرز الثمار وتخزينها على درجة الصفر المئوى ورطوبة نسبية ٩٠ – ٩٥ ٪ ولمدة ١٥ اسبوع.

أوضحت النتائج المتحصل عليها أن رش اشجار الكمثرى قبل الحصاد سواء بمستخلص الأعشاب البحرية أو بالخميرة الجافة النشطة أدى إلى:

- زيادة وزن وصلابة الثمار وكذا محتواها من المواد الصلبة الذائبة والحموضة الكلية.
- أخر تحول لون الثمار من الأخضر الداكن إلى الأخضر المصفر.
- زيادة محتوى الأوراق (خلال نفس الفترة) من النتروجين والفسفور ولم يكن لها تأثير معنوى على محتواها من البوتاسيوم.
- تفوق مستخلص الأعشاب البحرية فى زيادة وزن الثمار مقارنة بالخميرة الجافة النشطة والكنترول.
- تفوق الخميرة الجافة النشطة فى زيادة محتوى الأوراق من الفوسفور.
- زادت كفاءة المعاملات سواء مستخلص الأعشاب البحرية أو الخميرة الجافة النشطة بزيادة التركيز المستخدم.
- أما بالنسبة لتاثيررش اشجار الكمثرى قبل الحصاد سواء بمستخلص الأعشاب البحرية أو بالخميرة الجافة النشطة على خصائص الثمار الطبيعية والكيماوية أثناء التخزين على درجة الصفر المئوى فالنتائج المتحصل عليها أوضحت أن:
- مستخلص الأعشاب البحرية والخميرة الجافة النشطة كان لهما تأثيراً ملموساً فى تقليل كلاً من نسبة الفقد فى الوزن وفساد ثمار الكمثرى بالإضافة إلى تقليل معدل تدهور صلابة الثمار ومعدل تحولها إلى اللون الأصفر خلال فترة التخزين.
- لم يكن هناك تأثيراً واضحاً على كلاً من نسبة المواد الصلبة الذائبة والحموضة الكلية أثناء التخزين.
- مستخلص الأعشاب البحرية و الخميرة الجافة النشطة كان لهما نفس الأثر على تقليل نسبة الفقد فى وزن الثمار أثناء التخزين ، بينما تفوقت الخميرة الجافة النشطة فى تقليل حدوث التلف الناشئ عن الفطريات والبكتيريا فى ثمار الكمثرى صنف "ليكونت" أثناء التخزين.