INTRODUTION

INTRODUCTION

In Egypt, total acreage of apple orchards occupy about 76000 Feddans with total fruit production of about 438000 tons, while pear orchards produce about 54000 tons from about 15000 Feddans*.

Botanically, apple (genus Malus) and pear (genus Pyrus) belong to the family Rosaceae and sub-family Pomoideae which includes both Malus and Pyrus genera. However, earlier botanists had included both apple and pear in the same genus i.e. "Pyrus", and therefore apple so called Pyrus malus **(Chandler, 1957)**.

Anna apple (Malus domestica, Bock) or (M. sylvestris, Mill), the most important apple cultivar in Egypt, it is a hybrid between Golden Delicious and Red hadassiya (old Palestinian cultivar), also Le-Conte pear (Pyrus lecontei, Rehd.), the most popular and favourite cultivar is a hybrid between Chinese sand pear (Pyrus serotina, L.) and European pear (Pyrus communis, L.).

In pome fruits, adequate pollination is necessary for fecundation, embryo formation, fruit set, seed development, fruit retention and lastly the yield and fruit quality. The lack of good pollination and presence of self and cross incompatibility may often prevent the tree cropping from reaching its full capacity. Where pollination is adequate, the main limiting factor of cropping in the pome fruits is so called "June drop." i.e. the partial shedding of recently developed fruits. The shedding of fruits may occur in one or more waves which correspond to the periods when the growth hormones content of the fruit is normally low whereas the fruits which drop are usually those with the lowest complement of fertile seeds **(Williams, 1969).**

---

* Central institution of general recruit and statistics. Annual statistical Book, June, 1996 Egypt.

Several investigators reported that the use of pollinizers for Anna apple and Le-Conte pear plantation, enhanced tree productivity through increasing fruit set and reducing fruit drop. **(Ali, 1992).**

However, in order to determine the suitable pollinizer for both species under study, the cytological study have proved to be helpful in determining the suitability of some species or cultivars and to be recommended as a proper pollinizer for each species. Besides, the chromosomal behaviour of a species or cultivar might help in stating the degree of relationship between the parent species and cultivars. This relationship was based on chromosome pairing of this species and cultivars and the appearance of univalent chromosomes which disturbed the meiotic cycle as they lag behind and these may not include in daughter nuclei resulting in the abortion of pollen mother cells (PMC's) products. Therefore, this study aimed to throw some light on some factors or reasons may be prevent the self or auto-fruitful through investigating the variation among some species and cultivars of pome fruits cytologically. A detailed analysis included the comparison of chromosome number, chromosome pairing, chromosomal behaviour at meiosis and pollen viability of Anna apple, Ein Shamer apple, Dorsett Golden apple, Le- Conte pear, Bartlett pear, Calleryana pear and Balady quince, as well as the relationship between chromosomal behaviour and pollen grains viability were studied. Beside, this investigation was undertaken to study the effect of self and cross pollination treatments with pollens of Ein Shamer apple cv., Dorsett Golden apple cv., Bartlett pear cv., Calleryana pear cv., and Balady quince cv. on fecundation, fruit set, fruit drop, embryo development, seed formation, mature fruits and fruit quality of Anna apple and Le-Conte pear. In addition, histological study dealing with the ovules development and abortion, was also carried out hoping to help in detecting the sequent stages of seed development of

Anna apple and Le-Conte pear, particularly the time at which seed abortion take places and it's effect on fruit shedding.

Many horticultural means are used to direct growth of trees for increasing their fruitfullness and improved fruit quality, dwarfing rootstocks are used to improve the manageability of fruit trees, but the proper choice of rootstock/scion combination for each soil is difficult.

Optimum levels of fertilizer are important to give a proper balance between vegetative growth, fruit load and return bloom. Cultural practices such as limb spreading or tying are useful to retard vigorous upright growth and increase spur development but are expensive and generally limited to training of young trees. As trees get older heavy dense canopies shade lower portions of the tree and result in low vigor spurs with inferior flowers and fruit, and growers are at a loss to know how to manage the trees. These delicate balancing acts performed by growers each year become expensive and are often impossible to do because of weather and other factors over which there is little control.

The first attempt to control tree size with chemicals was reported by **(Batjer et al., 1963)**. The chemical used was referred to as B-9, which later was given the common name daminozide and the trade name Alar, also it was known as a chemical name; succinic acid 2,2-dimethyl hydrazide (SADH). The other chemicals have been tested; cycocel (CCC); PP_{333} [1, (4-chlorophenyl) –4, 4-dimethyl –2 (1, 2, 3-triazol –1— yl) pentan-3-ol] or paclobutrazol which was formulated as "Cultar" **(Williams and Edgerton, 1983).**

Although the inhibition of internode extension appears to be the primary physiological effect on fruit trees of growth retardants such as chlormequat (CCC), daminozide or Alar (SADH) and paclobutrazol (PP_{333}), these compounds can also affect flower initiation and fertility,

fruit abscission, development and maturation. Of these compounds, paclobutrazol has the most clearly identified biochemical mode of action, specifically inhibiting three steps in the oxidation of the gibberellin precursor ent-kaurene to ent-kaurenoic acid**(Hedden and Graebe, 1985).**

An indirect way in which paclobutrazol might stimulate flower initiation is via inhibition of shoot growth. Flower initiation in apple and pear is correlated with a marked shortening of the plastochrone (i.e. the average time interval between the appearance of successive primordia within the bud), prompting the suggestion that floral initiation might be triggered by the accumulation of a critical number of primordia. Thus it was proposed that growth regulators might affect flower initiation indirectly by modifying the plastochrone, rather than by acting directly on floral induction. For example, a "weakening of apical dominance" by growth retardants of the sink strength of shoot tips might divert assimilates to the buds, and shorten the plastochrone **(Luckwill and de Silva, 1979).** When paclobutrazol (375 p.p.m) was applied twice to young apple cv. Gloster trees, much reduced levels of auxin-like activity and diffusible gibberellin were found in the diffusate from shoot tips sampled 2 or 4 days after the second treatment. DNA and RNA levels of cell nuclei observed in shoot apex sections were, however, higher for the treated trees **(Buban and Nagy, 1987)**.

Pome fruits particularly Le-Conte pear trees produce vigorous branches with an upright growth habit resulting in delaying and scanty fruiting. Also, in the absence of suitable dwarfing rootstocks and limitation of pruning, the use of chemical growth retardants has assured the growers of temperate zone fruits to control the vigour of tree growth in high density planting systems. Paclobutrazol (Cultar, PB or PP_{333}) has been used as a broad spectrum growth retardant (50-2500p.p.m. at full bloom and/or during the growth season) to reduce growth, enhance

flowering and to improve productivity through increasing fruit set, reducing fruit drop and increasing tree yield and enhance fruit quality of apple and pear trees **(Tromp, 1987; Jones et al. 1988, Jones et al. 1991; Rai and Bist, 1991)**. Also, cycocel (chlormequat, CCC) has been reported to restrict tree growth, enhance flowering, improve productivity and fruit quality of apple and pear trees when sprayed at 1500 – 2000 p.p.m at full bloom or at successive times during intensive shoot growth **(Waart, 1986, Tymoszuk and Mika, 1986; Othman, 1991; Rai and Bist, 1991).**

Consequently, this study aimed to investigate the chromosomal behaviour & pollens viability of (Le-Conte pear, Anna apple & some pollinizers) cytologically and effect of some pollination treatments on fruiting aspects of these 2 pome cvs. from one hand, besides the effect of full bloom and mid-June sprays with paclobutrazol and cycocel on growth, flowering, fruiting and fruit quality of the two following years (1996 & 1997) as well as their effect on the course of flower bud differentiation for both Anna apple and Le-Conte pear trees from the other.