INTRODUCTION

Thousands of years ago, people have used wild naturally growing plants, in many purposes in their daily life. Nowadays, many people still benefit from them by eating their edible parts (e.g. shoots of *Cichorium intybus* and *Portulaca oleracea*, and fruits of *Ficus carica*), using some plant parts to improve taste and flavour of foods (fruits of *Myristica fragrans* and *Eltetaria cardamomum*), chewing or smoking the leaves of some others as a kind of addiction (*Papaver somniferum* and *Nicotiana tabacum*), using their burning fumes as pesticides (*Achillea fragrantissima*), using some plants or their extracts for curing diseases (leaves of *Mentha piperata* and *Eucalyptus globulus*, and seeds of *Nigella sativa*), and many other different uses.

Crude extracts of medicinal plants have been used extensively in the last few years instead of the synthetic drugs. Also, many other plant products like tea, coffee, cola, cocoa, tobacco, natural narcotics, etc. are consumed with various degrees of consumption all over the world. This has led scientists to investigate the effects of these plant extracts from the morphological, physiological and cytological points of view. The chemical constituents of these plants were also analysed by phytochemists.

Indeed, the wrong usage or overdosage of the plant water extracts consumed by people may cause harmful effects in the body cells which may lead to health hazards. Many cytologists tried to investigate the mitotic and meiotic effects of such extracts where changes in mitotic and/or meiotic cycles could represent an indicator for the mutational potential of a substance under test. Among the pioneer cytologists who investigated these effects appear Kubiak (1960) who studied the influence

of *Inonotus obliquus* extract on mitosis in *V. faba*, Ono (1960) who studied the meiotic effects of extracts from the noxious plant *Cicuta virosa*, and he continued with Tanihuzi on the mitotic effects of *Arisaema japonicum* and *Chelidonium majus* extracts (Ono and Tanihuzi, 1960). Tarkowska (1971) investigated the antimitotic effects of *Nerium oleander* extract. Sudharsan and Subba Reddy (1971) compared the cytological effects induced by the leaf extracts of two varieties of *Lathyrus sativus* on meiosis of *V. faba*. In 1973 Asp proved the potentiating effect of caffeine (the main ingredient of tea and coffee) on the production of chromosomal aberrations by alkylating agents like mitomycin C in *Vicia faba* root tip cells and Chinese hamster cells. Abraham and Cherian (1978) demonstrated the severe effects of treating *Allium cepa* root tip cells with extracts of *Piper betle* leaves, which are chewed by many people in countries like India and Ceylon. Agglomeration of chromosomes, bridged metaphases and giant nuclei were among the abnormalities induced by this treatment. Shehab *et al.* (1978) noted the accumulation of prophases after the direct treatment of *A. cepa* and *V. faba* root tip cells with *Achillea fragrantissima* extract, while after recovery the accumulation of metaphases was oberved. In studying the effect of khat extract, Kabarity and Mallah (1980) showed a mitodepressive effect on the rate of cell division in *A. cepa* root tips, and that this effect was positively correlated with time of treatment, till it reached a maximum of complete inhibition of cell division. Shehab and Adam (1983) studied the mitotic effects of water extract of *Anastatica hierochuntica* L. on *A. cepa* root tip meristems. A depression in the mitotic index was recorded after direct and recovery treatments, in addition to an increase in the percentage of total abnormalities with increase of time and concentration. The abnormalities scored were despiralization, spindle disturbance, stickiness, laggards and bridges.

Treatment of *V. faba* flower buds with extracts of *Datura innoxia* and *Hyoscyamus muticus* induced meiotic disorders which were similar to those induced by the pure active ingredients, atropine and hyoscine alkaloids (El-Sedawy, 1983). He noticed that the harmful effects of the treatments diminished by time lapse from 24 to 48 hours, and that the major types of abnormalities were stickiness, bridges, laggards, spindle disturbance and chromosome fragmentation. In investigating the influence of *Ammi majus* and *A. visnaga* extracts on the meiosis of *V. faba* Shehab *et al.* (1984) found that the percentage of anomalies in the first division was higher than those in the second division, but both of the plants extracts caused a decrease in the pollen grain length and gave mild increase in the pollen viability.

Patnaik *et al.* (1984) studied the effect of zarda (processed tobacco leaf) extract on the mitosis of *A. cepa* and he noticed that high concentrations (1.5% and 1%) of the extract were highly mitostatic, whereas lower concentrations (0.75%, 0.5% and 0.25%) produced various types of chromosomal damage. They also observed stretching and fracture in the centromeric regions which became evident at metaphase in addition to many other abnormalities like pulverization of chromosomes which lead to nuclear disintegration. Adam and Rashad (1984 and 1985) successively studied the mitotic effects of water extracts of two species of the genus *Ammi*, namely *Ammi majus* and *A. visnaga* on root tip cells of *V. faba*. The extract of *A. majus* caused a delay in the completion of the mitotic cycle and it was noted that the prophase and metaphase were the most influenced stages by the extract. On the other hand, the extract of *A. visnaga* affected the spindle formation and chromosomes rather than affecting the DNA synthetic period, where

prophase accumulation was observed. The two extracts induced the formation of some similar and some different types of abnormalities. The water extract of *Solenostemma argel* (hargal) lengthens the cell cycle of *A. cepa* root tip cells producing low mitotic indices through an effect on protein and nucleic acid synthesis (Adam and El-Nahas, 1988). They also recorded the induction of a number of mitotic irregularities like c-mitosis, stickiness, laggards and disturbed types. Adam and El-Sedawy (1988) noted a mitodepressive effect of *Datura innoxia* and *Hyoscyamus muticus* extracts on *V. faba* meristem and that this effect was time and concentration dependent. They claimed that the chromosome chemistry (DNA) and spindle constituents (micro-tubules) may be affected in a way giving rise to a number of chromosomal anomalies like stickiness, abnormal prophases, bridges, and disturbed spindles. In the same year (1988) Farah studied the effects of another medicinal plant extract, namely *Glycyrrhiza glabra*, on *V. faba* mitosis and she recorded a recoverable depression in the mitotic index as well as a number of mitotic abnormalities whose percentages decreased after recovery. Adam and Farah (1989) studied the mitotic effects induced by water extract of *Cymbopogon proximus* (halfa barr) and they scored a mitotic delay of *V. faba* root tip cells caused by all the used concentrations with a significant role of the long durations and significant percentages of the induced abnormalities. Hegazy *et al.* (1990) examined the phytotoxic effect of the aqueous extract of *Anastatica hierochuntica* L. on seed germination, seedling growth and cell division of *Cleome droserifolia* and on five other desert plants. They oberved a gradual increase in the percentage of prophase and decreases in the other mitotic phases as well as the mitotic index while increasing the extract concentration. The cytological changes produced by the aqueous extract of red pepper were investigated in the root meristems of *V. faba* by John and Abraham (1991). They observed

statistically significant differences from controls with a wide spectrum of abnormalities. Saggo *et al.* (1991) studied the mitotic effects of *Tylophora indica* leaf homogenate on *A. cepa* root meristem. They found that lower concentrations of the leaf homogenate caused mitoactivation, while higher ones were mitodepressive. In addition, physiological aberrations (stickiness, laggards and hyperploidy) as well as clastogenic aberrations (chromosome breaks, ring chromosomes and chromatin bridges) were induced. Recently, Banerjee (1992) was one of the many investigators who studied the cytological effects of tobacco extracts. He found that certain concentrations of these extracts were mitogenic in *A. cepa* root meristem, and that some aberrations like stickiness, bridges, diplochromatid and clumping of chromosomes were recorded.

These studies, and many others, tried to uncover the undesired cytological effects of water extracts of many plants that are used progressively by people today. That these effects may be heritable, increases the importance of such investigations.

The present work aims to study the cytological effects of the water extracts of two wild plants growing naturally in Egypt and used by many people. The first is *Cleome droserifolia* (Forssk.) Del., used in folk medicine as a hypoglycemic drug. The other is *Portulaca oleracea* L. which is eaten by many people and is also fed to cattles. The study aims also to test the mitotic effects of some pure chemical constituents isolated from the two plants to compare their cytological effects with those of the crude water extracts of the plants.