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Full Length Research Paper

Traditional medicinal plants research in Egypt: Studies of antioxidant and anticancer activities

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Plants have played a significant role in the treatment of cancer and infectious diseases for the last four decades. Natural products have been rediscovered as important tools for drug development despite advances in combinatorial chemistry. Egyptian flora, the most diverse in the world, has become an interesting spot to prospect for new chemical leads or hits due to its species diversity. Screening programs have been established in Egypt as a strategy to identify potentially active substances. High throughput screening techniques allow for the analysis of large numbers of extracts in a relatively short period of time and can be considered one of the most efficient ways of finding new leads from natural products. In our study, 23 wild plants were extracted by ethanol and water in addition to 24 ethanolic and aqueous extracts from spices and herbs and tested *in vitro* as anticancer agents. The trypan blue technique was used for the anticancer activity against Ehrlich Ascites Carcinoma Cells (EACC) while SRB technique was used against HepG2 cells. The antioxidant activity of the 90 plant extracts was determined by 2, 2 diphenyl-1-picrylhydrazyl (DPPH) assay. Results showed that both of ethanolic and water extracts of some plant possessed high cytotoxic and antioxidant activities and inhibited the cell growth of cancer cells. On the other hand, some ethanolic extract gave cytotoxic and antioxidant activities more than aqueous extract but other aqueous extracts possessed the opposite trend. We believe that the flora of Egypt can be a valuable source of plants rich in, cytotoxic compounds and antioxidant agents.

Key words: Anticancer, antioxidant, polar extracts, Egyptian flora.

INTRODUCTION

Scientists are interested in investigating medicinal plants which are commonly used by public and derived from folklore or anecdotal information (Helton, 1996; Mail et al., 1989). In this concern, El-Shemy et al. (2007) reported that the medical use of herbs is deeply rooted in human history and folklore and incorporated into the historical medicine of virtually all human cultures. He described the history of Ginseng and Garlic as two famous plants widely used –till now- in traditional medicine and proved to have many active constituents. Some famous selected examples used to represent the importance of those plants based on human observation, trial and error, religious advices and from various generations' accumulated experiences, which should never neglected or classified as unscientifically based treatment. The medicinal plants derived from folklore are huge hence; *Zingiber officinale* (Amara et al., 2008) and *Nigella sativa* (Ferrigni et al., 1982; Ferrigni and Mchaughlin, 1984) were taken in consideration as extracts containing antitumor compounds.

Herbal or 'botanical' medicines, recorded in developing countries with ancient civilizations, such as Egypt and

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Abbreviations: ROS, reactive oxygen species**; O^{-}_{2},** superoxide radical; **OH,** hydroxyl radical; **ROO˙,** hydroperoxyl radical; **RNS,** nitrogen species; **˙ONOO-,** peroxynitrite; **NO˙,** nitric oxide; **DNA,** deoxyribonucleic acid; **EACC,** Ehrlich Ascites Carcinoma Cells; **DPPH,** 2, 2 diphenyl-1-picrylhydrazyl; **NCI,** National Cancer Institue; **HepG-2,** human hepatocellular cancer cell line; **CNE_2**, carcinoma cell line; **MGC-803,** gastric cancer cell line.

China, provide an abundant Pharmacopoeia of products that have been prescribed for many diseases over many centuries. The natural products underlying traditional medicines have received increased scientific attention lately (Han et al., 2002; Vickers, 2002). Since there are national and indigenous rights over plant derived resources, basic scientific investigations based on medicinal plants and indigenous medical systems have increased in developing countries (Han et al., 2002; El Shemy et al., 2007). In addition, Egypt includes wide areas of desert and tropical regions which encourage the growing of wild plants resistant for those hard conditions. Therefore, these plants might contain different secondary metabolites with high biological value which can be used for treatment of different diseases including cancer.

The Mediterranean region, despite its location in a temperate zone far from the diversity hotspots popularized by the media, it is one of the areas with the greatest diversity on the planet and thus it is considered that it should be maintained as a conservation sanctuary (Myers et al., 2000). About 10% of the world's higher plants can be found in this area, which represents only 1.6% of the Earth's surface (Médail and Qu´ezel, 1999). Around 25,000 species are found in the region.

Cancer is a general term applied to malignant diseases characterized by rapid and uncontrolled abnormal cells formation which may mass together to form a growth or proliferate throughout the body and it may progress until it causes death. Medicinal plants are the most exclusive source of life saving drugs for the majority of the world's population. Medicinal herbs have been widely used for treatment of diseases in traditional way for several generations. An interaction between traditional medicine and modern biotechnological tools is to be established towards new drug development. The interference between cell biology, *in vitro* assays and structural chemistry will be the best way forward to obtain valuable leads. There is considerable scientific evidence to suggest that nutritive and non nutritive plant-based dietary factors can inhibit the process of carcinogenesis effectively.

Cancer chemoprevention involves pharmacologic intervention with synthetic or naturally occurring chemicals to prevent, inhibit or reverse carcinogenesis or prevent the development of invasive cancer. Out of an estimated 250,000 higher plants, less than 1% has been screened pharmacologically (El-Shemy et al., 2007.). In recent years, focus on plant research has increased all over the world.

Antioxidants are a group of substances that are useful for fighting cancer and other processes that potentially lead to diseases such as atherosclerosis, Alzheimer's, Parkinson's, diabetes and heart disease (Valko et al., 2007). Unlike cytotoxic agents that damage tumor cells, antioxidants act by preventing the onset of cancer during carcinogenesis, and they are generally beneficial to cells. Oxidants such as reactive oxygen species (ROS) that include the superoxide radical (O^{-}_{2}), hydroxyl radical (OH), hydroperoxyl radical ($ROO^{\cdot}$) and nitrogen species (RNS) such as peroxynitrite ($^{\cdot}ONOO$-) and nitric oxide ($NO^{\cdot}$) damage macromolecules, including proteins, lipids, enzymes and deoxyribonucleic acid (DNA) (Sies, 1993). To combat these radicals, living organisms produce enzymes (for example, catalase, superoxide dismutase and peroxidase) or rely on nonenzymatic molecules, such as glutathione, cysteine, ascorbic acid, flavonoids and vitamin K for protection (Sies, 1993).

The aim of this study is to evaluate the anticancer and antioxidant capacity of traditionally and fresh medicinal plants collected from different regions in Egypt.

MATERIALS AND METHODS

Collection of plants materials

Wild plants materials used in this investigation were collected from El-Alaemeen-Coastel area, Sedi Abd El-Rahman, Egypt, during February – March, 2010. Taxonomy section for the wild plants was preceded by Prof. Dr. Sherif S. El-Khanagrs, ARC, CAIM Herbarium of Museum, Dokki, Egypt. The plant samples (Whole plant) was air dried then grounded to a powder using mechanical mortar. Also ten fresh samples were tested for anticancer and antioxidant activity. The fresh samples were purchased from local commercial shops which include: *Capsicum annuum, Solanum lycopersicum, Daucus carota, Psidium guajav, Citrus limon* (L.) Burm*, Ficus carica, Phoenix dactylifera, Vitis vinifera* except *Eichhornia compressa* which was collected from Nile River (Tables 1 to 3).

Preparation of extracts

Different crude extracts of wild and traditional plants as well as, fresh plants were prepared according to Ferrigni et al. (1982). To obtain the aqueous and ethanolic extracts samples were cleaned and air dried (except fresh samples) then grinded to be ready for testing. The specific plant samples (roots, leaves, fruits and bulbs) were extracted with water and ethanol as follows: 5 g of air dried sample were grinded in the presence of about 30 ml cold distilled water and filtered then centrifuged at 3000 rpm for 10 min. The supernatant was separated solvents removed under reduced pressure. Each extract was then transferred to an 10 ml weighed, small and clean glass vial and the crude extract weight was determined. All the extracted materials were preserved at -20°C until analysis of biological activities.

Viability of Ehrlich Ascites Carcinoma Cells (EACC) using trypan blue-exclusion technique

A line of Ehrlich Ascities Carcinoma from National Cancer Institute (NCI) Cairo, Egypt has been used. The tumor line is maintained in female Swiss albino mice by weekly intraperitoneal (ip) transplantation of 2.5×10^{6} cells. The cells were taken from tumor transplanted animals after ≈ 7 days of transplantation. The cells were centrifuged at 1000 rpm for 5 min, washed with saline then the needed number of cells was prepared by suspending the cells in the appropriate volume of saline according to the tests used. Transplantation in animals for cell line, the appropriate volume of ascities can be used directly.

The viability percentages of tumor cells after incubation with aqueous or ethanolic extract as well as saline as control were

Table 1. Scientific name, Family, plant part, Arabic name and plant picture of wild plants (Collected from El-Alameen , Sidi Abd El-Rahman and Marsa Matrouh regions at winter season 2010).

Scientific name	Family	Plant part tested	Arabic name	Plant picture
Atriplex sp	Chenopodiaceae	Whole plant	لقطف	
Euphorbia paralias L.	Euphorbiaceae	Whole plant	لبينة	
Cakile maritime Scop.	Cruciferae	Whole plant	كاكيل	
Panax quinquefolius	Araliaceae	Seeds	جنسنج	
Rosmarinus officinalis	Lamiaceae	Whole plant	حصي لبان	
Zygophyllum album	Zygophyllaceae	Whole plant	بلبال	

Table 1. Contd.

Asparagus stipularis	Liliaceae	Whole plant	اسبراجيس	
Kochia indica	Chenopodiaceae	Whole plant	كوكيا	
Retama raetam (Forssk) Webb	Leguminosae	Whole plant	الرتم	
Olea europaea L.	Oleaceae	Whole plant	الزيتون الاوربى	
Pituranthos tortusous	Umbelliferae	Whole plant	قزاح	
Limoniastrum monopetalum (L.) Boiss.	Plumaginaceae	Whole plant	زيتة	

Table 1. Contd.

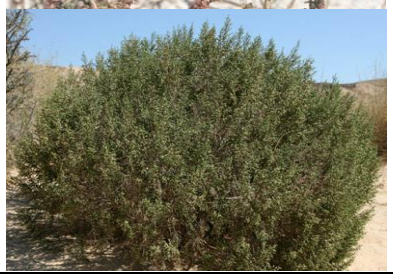
Cistanche phelypaea (L.)	Orobanchaceae	Whole plant	دنون	
Moricandia nitens	Cruciferae	Whole plant	موركاندي	
Zygophulum simplex L.	Zygophyllaceae	Whole plant	الرطريط	
Arum palaestinum	Araceae	Leaves	لوف	
Anabasis artiaulata (Forssk.) Moq.	Chenopodiaceae	Whole plant	العجرم	
Thymelaea hirsute (L.) Endl.	Thymelaeaceae	Whole plant	المتنان	

Table 1. Contd.

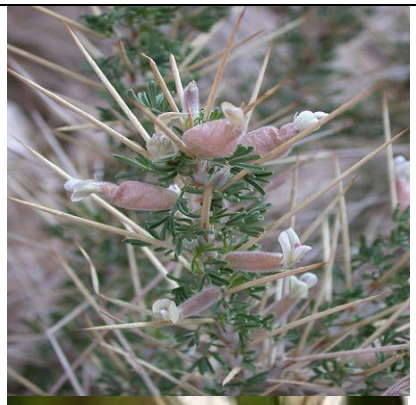
Astragalus pinosus	Leguminosae	Whole plant	استراجلس	
Asphodelus microcarpus	Liliaceae	Whole plant	العنصل	
Solanum nigrum	Solanaceae	Whole plant	عنب الديب	
Lotas polyphylles	Leguminosae	Whole plant	لوتاس	
Beta vulgaris	Chenopodiaceae	Whole plant	بنجر السكر	

Table 2. Scientific name, Family, plant part, Arabic name and plant picture of Spices and herbes.

Scientific name	Family	Plant part tested	Arabic name	Plant picture
Camellia sinensis	Theaceae	Leaves	شاي اخضر	
Cinnamomum verum.	Lauraceae	Bark	قرفة	
Punica granatum	Punicaceaea	Fruit	رمان	
Glycyrrhiza glabra	Galegeae	Seeds	عرقسوس	
Capsicum annuum	Solanaceae	Fruit	فلفل احمر	

Table 2. Contd.

Ocimum basilicum	**Lamiaceae**	**Seeds**	ريحان	
Zingiber officinale	Zingiberaceae	Rhizome	زنجبيل	
Curcuma longa	Zingiberaceae	Rhizome	كركم	
Cassia italca	Leguminosae	Leaves	سنامكي	

measured by the modified cytotoxic trypan blue-exclusion technique of Bennett et al. (1976). Two ml of media containing EACC (2 ×10^4 cells) were transferred into a set of tubes each, then 100 µg/ml from different extract were added into the appropriate tube as well as saline. The tubes were incubated at 37°C for 2 h then centrifuged at 1000 rpm for 5 min and the separated cells were suspended in 2 ml saline. For each examined materials (and control), a new clean, dry small test tube was used and 10 µl of cell suspension, 80 µl saline and 10 µl trypan blue (0.4%) were added and mixed, then the number of living cells (non stained) was calculated using a homocytometer slide by microscope (Nikon, TMS).

Viability of HepG-2 cells using SRB assay

Human hepatocellular cancer cell line (HepG-2), was obtained from the Vaccera (Giza, Egypt). Cells were maintained in RPMI-1640 supplemented with 100 µg/ml streptomycin, 100 units/ml penicillin and 10% heat-inactivated fetal bovine serum in a humidified, 5% (v/v) CO_2 atmosphere at 37ºC. The cytotoxicity of fresh crude extract was tested against HepG-2 cells by SRB assay as previously described (Skehan et al., 1990). Exponentially growing cells were collected using 0.25% Trypsin-EDTA and plated in 96-well plates at 1000-2000 cells/well. Cells were exposed to each test compound for 72 h and subsequently fixed with TCA (10%) for 1 h at 4ºC. After several washings, cells were exposed to 0.4% SRB solution for 10 min in dark place and subsequently washed with 1% glacial acetic acid. After drying overnight, Tris-HCl was used to dissolve the SRB-stained cells and color intensity was measured at 540 nm.

DPPH method

The 2, 2 diphenyl-1-picrylhydrazyl (DPPH) test was carried out as described by Burits and Bucar (2000). One ml of plant extract (100 µg/ml) was mixed with 1ml DPPH reagent (0.002% (w/v)/methanol solution). After an incubation for 30 min in the dark at room temperature, the absorbance was measured at 517 nm Butylated hydroxyl toluene (100 µg/ml) was used as positive control.

Table 3. Scientific name, Family, plant part, Arabic name and plant picture of fresh vegetables and fruits.

Scientific name	Family	Plant part tested	Arabic name	Plant picture
Capsicum annuum	Solanaceae	Whole plant	فلفل احمر	
Capsicum annuum	Solanaceae	Whole plant	فلفل رومي	
Daucus carota	Umbelliferae	Whole plant	جزر	
Psidium guajava L	Myrtaceae	Leaves	جوافة	
Solanum lycopersicum	Solanaceae	Bark	طماطم	

Table 3. Contd.

Citrus limon (L.) Burm	Rutaceae	Fruit	ليمون	
Vitis vinifera	Vitaceae	Whole plant	عنب	
Ficus carica	Moracea	Whole plant	تين	
Phoenix dactylifera	Palmaceae	Whole plant	بلح	
Eichhornia azurea	Pontederiaceae	Fruit	ورد النيل	

RESULTS AND DISCUSSION

Trypan blue assay was used for the evaluation of anticancer activity of ethanolic and aqueous extracts against EACC. The anticancer activities of 35 plant extracts showed that 17 ethanolic and 18 aqueous

Table 4. Anticancer and Antioxidant activity of different extracts from wild plants.

Scientific name	Anticancer activity		Antioxidant activity	
	Water	Ethanolic	Ethanolic	Water
Atriplex Sp.	100	49	**70.8**	50.5
Euphorbia paralias L.	3.3	2.4	81.1	51.8
Cakile maritime Scop.	89.7	90.78	56.3	55.6
Panax quinquefolius	64	2.55	11.7	56
Zygophulum album L.F	61.13	32.86	80.3	64.8
Asparagus Stipularis)	13	5.2	72.7	70.9
Kochia indica wight	2.88	1.6	50.4	72.4
Retama raetam (Forssk) Webb	2.6	1.4	80.2	78.1
Olea europaea L.	0	7.98	50.5	81.1
Pituranthos tortusous	11.21	14.28	58.4	81.4
Limoniastrum monopetalum (L.) Boiss	52.9	3.8	85.6	82
Cistanche phelypaea (L.)	37	100	50.7	85.6
Moricandia nitens	89.19	51	89.8	85.6
Zygophulum simplex L.	61.13	32.86	85.7	44.1
Arum palaestinum	97.29	19.44	12.7	43.1
Anabasis artiaulata (Forssk.) Moq	25	10	40.8	42.7
Thymelaea hirsute (L.) Endl.	54	18	78.6	35.3
Astragalus pinosus.	100	15.83	28.4	19.5
Asphodelus microcarpus salzm	9.09	1.94	60.3	49.5
Solanum nigrum	100	89.74	85.7	55.6
Lotas polyphylles	7.15	7.9	27	27
Beta vulgaris	64	6.99	41.1	30.3

extracts gave anticancer activity more than 70% (Tables 4 and 5).

The maximal inhibition (100%) was observed in the ethanolic extracts obtained from *Solanum nigrum, Atriplex* sp. and *Astragalus spinosus* followed by *Arum palaestinum* (97.29%) as in Tables 4 and 5. While ethanolic extract obtained from *Cakile maritime, N. sativa* and *Z. officinale* possessed anticancer activity of 89.7, 81 and 80%, respectively. It was observed that the ethanolic extract obtained from *Ocimum basilicum, Cassia italca, Panax quinquefoliu* and *Zygophulum simplex* were in the third category which gave anticancer activity more than 60% (77.21, 66, 64.1 and 61%, respectively), while *Thymelaea hirsute* and *Limoniastrum monopetalum* showed anticancer activity more than 50% (54 and 53%). On the other hand, twenty two ethanolic extracts gave weak anticancer activity (0.0 to 47.83%) (Tables 4 and 5).

In the water extracts tested, data also showed that the maximal cancer inhibition was observed by *Cistanche phelypaea, Solenostemma argel, C. italca* and *Cakile maritime* extracts (100, 95, 92 and 90.78%, respectively). Extracts from, *S. nigrum, camellia sinensis* and *Glycyrrhiza glabra* showed anticancer activity more than 80% (89.7, 86.4 and 81%, respectively). It was clear from the results that both aqueous and ethanolic extracts of *S. nigrum, C. maritime and O. basilicum* possessed high anticancer activity such inhibited completely cell growth of EACC at the 100 µg/ml concentration.

However, some other aqueous extracts provided high anticancer activity more than ethanolic extract such as *Arum palaestinum, N. sativa, P. quinquefolius, Z. simplex, T. hirsute* and *L. monopetalu*.

These results were in agreement with the results obtained by Nawab et al. (2011) who reported that exposure of aqueous extract of *S. nigrum* (due to steroidal glycosides and glycoprotein) exerted an inhibitory effect on cell growth and colony formation of the prostate, breast and colorectal cells. In addition, Li et al. (2008) found that aqueous extract of *S. nigrum* inhibits growth of cervical carcinoma (U14). Extract of *C. sinensis* inhibited three tumor cell lines (HeLa cell line, poorly differentiated nasopharyngeal carcinoma cell line (CNE_2) and gastric cancer cell line (MGC-803) due to inhibition of DNA topoisomerase II (Bingfen et al., 1994). *G. glabra* extract used to treat chronic hepatitis, other viruses, various types of ulcers and this extract is composed of triterpenes saponins, flavonoids, polysaccharides, pectin, simple sugars, amino acids, mineral salts, and various other substances (Saxena, 2005).

In other side, Verotta and El-Sebakhy (2001) revealed that, *Astragalus* species were used in Chinese traditional medicine as antiperspirant, antihypertensive, antidiabetic,

Table 5. Anticancer and antioxidant of spices and herbs.

Scientific name	Anticancer activity		Antioxidant activity	
	Water	Ethanol	Ethanol	Water
Rosmarinus oficinalis	80.04	61	38.4	65.1
Camellia sinensis	85	86.4	85.4	70.6
Cockatiel	9.76	22.88	56.7	71.4
Punica granatum	6.08	4	85.7	75.8
Glycyrrhiza glabra	36	81	47.4	84.1
Capsicum annuum	24.35	68.63	57.3	25
Ocimum basilicum	77.21	76.29	72.3	9.8
Zingiber officinale	47.83	4.93	55.9	35.5
Curcuma longa	39.42	72.4	6.4	43.4
Cassia italca	89.7	90.78	55.4	30.7
Nigella sativa	81	2.54	8.4	8.8
Solenostemma argel	24.66	95	41.3	7
Parviflora	7.83	1.55	42.7	40.3

diuretic and tonic. The pharmacologically active constituents of *Astragalus* were classified to two different types, polysaccharides and saponins and the most interesting pharmacological properties were hepatoprotective, immunostimulant and antiviral activity.

Husein et al. (2011) reported that highest cytotoxicity for ethanolic extracts of *A. palaestinum* against breast cancer. Moreover, the anticancer activity of *N. sativa* may be attributed to the quinone constituents of the seed (Mahfouz and El-Dakhakhny, 1960). The anticancer activity of the methanol extract of *Cassia italica* against two types of cancer cell lines, (Hep-G2, Hela cell lines**)** was also detected. On the other side, anticancer activity of ten fresh samples against HepG2 was evaluated and the observed data showed that five aqueous extracts possessed high anticancer activity more than 90% (Table 4). Several studies have also demonstrated anti-cancer or anti-mutagenic effect of the chilli (*C. annuum*) extracts. Carotenoids present in chilli extracts were found to have a synergistic anti-mutagenic and *in vitro* anti-tumour-promoting activity (de Mejia et al., 1998; Maoka et al., 2001). *D. carota* has anticancer constituent, epilaserine, in its lipophilic fraction (Jing et al., 2008). Therefore, Sato et al. (2010) suggested that a combination bark leaf and root extract inhibited growth of B16 melanoma cells.

Epidemiological studies have suggested that an inverse association exists between consumption of vegetables and fruits and the risk of human cancers at many sites (Riboli and Norat, 2003). Phenolic compounds, including flavonoids are especially promising candidates for cancer prevention. Much information is available on the reported inhibitory effects of specific plant phenolic compounds and extracts on mutagenesis and carcinogenesis (Myers et al., 2000). The potential ability of polyphenol combinations to prevent cancer progression has not been adequately studied. Scientists have suggested that it appears extremely unlikely that any one substance is responsible for all of the associations seen between plant foods and cancer prevention because of the great variety of dietary phenolics, including flavonoids, and the many types of potential mechanisms reported (Birt et al., 2001; El-Shemy et al., 2007).

These results were in agreement with that of our previous work (Nassr-Allah et al., 2009) which showed that the hot water and ethanolic extracts of *S. arghel* and hot water extracts of *Colocasia antiquorum* may have an immuno-modulatory potential via stimulating antiproliferation of tumor cells. However, hot water and ethanolic extracts of *S. arghel* and hot water extracts of *C. antiquorum* significantly inhibited the growth of AML, ALL and EACC cells in vitro and *in-vivo*. This appears to involve apoptosis-induced cell loss; a lowering in the proliferation rate of AML cells. The immuno-modulatory components were associated with the content of phenolics, including flavonoids.

Further, the total phenolic contents correlated significantly ($P<0.05$) and positively with the activity of antioxidation enzymes *in vivo* and the percent inhibition of oxidation *in- vitro*. In addition, the anticancer activity was found to be related to alkaloids and phenolics from *C. italca* and *S. nigrum*, or only phenolics from water hyacinths and in addition to glycosides and plant acids from *C. italca*.

The change in absorbance produced by reduced DPPH was used to evaluate the ability of test compounds to act as free radical scavengers. The antioxidant activities of ethanolic and aqueous extracts of 35 plant samples (Wild and herbs) were formulated in Tables 4 and 5. As shown in the tables, 19 plant aqueous extracts gave antioxidant

Table 6. Anticancer and Antioxidant activity of fresh samples (Vegetables and fruits).

Scientific name	Moisture content %	Anticancer activity		Antioxidant activity	
		Water ethanolic		Ethanolic extract	Water extract
Capsicum annuum	89.57	92.36	91.32	90.3	81.8
Capsicum annuum	89	77.2	74.7	86	73.2
Daucus carota	90.7	92.09	93.25	85.6	81.5
Psidium guajava L	97.07	91.13	92.09	97.3	88.4
Solanum lycopersicum	93.9	81.3	82.8	82.8	82.6
Citrus limon (L.) Burm	82.9	86.7	*91.3*	91.3	70.4
Vitis vinifera	85.08	82.6	89.2	90.5	85
Ficus carica	91.25	82.6	83.4	84	80.5
Phoenix dactylifera	72.67	88.6	79.3	83.4	77
Eichhornia azurea		91.3	90.5	54.1	50.5

activity more than 50% while the other samples were less (Table 3). It was observed that the aqueous extracts obtained from *Retama raetam, Punica granatum, Kochia indica, Cinnamomum verum* and *Asparagus stipularis* came in the third category which gave more than 70% antioxidant activity (78.1, 75.8, 72.4, 71.1, 70.9 and 70.6%, respectively). The results also showed that seven aqueous extract obtained from *Zygophyllum album*, *Rosmarinus oficinalis*, *P. quinquefolius, C. maritime, S. nigrum, Euphorbia paralias* and *Atriplex* sp. showed moderate antioxidant activity (50.8 to 64.8%). The other plant extracts had only weak antioxidant activity ranged 7 to 49.5% (Tables 4 and 5).

From the 35 ethanolic plant extracts tested *Moricandia nitens, Z. simplex, P. granatum, Limoniastrum monopetalum, Zygophulum album, E. paralias,* and *Retama raetam* gave the maximum antioxidant activity (80 to 89%). Also from table (3) it was observed that four ethanolic plant extracts from *T. hirsute, A. stipularis, O. basilicum* and *Atriplex* sp. gave antioxidant activity more than 70% (78.6, 72.7, 72.3 and 70.8%, respectively). Finally, the data showed that both aqueous and ethanol extracts of some plants possessed high antioxidant activity at the 100 µg/ml concentration such as *M. nitens*, *L. monopetalum* and *R. raetam.* However, aqueous extract of other plants gave high antioxidant activity more than ethanolic extract such as *R. raetam, O. europaea* and *Pituranthos tortuosus.* While, ethanolic extracts of some plants possess high antioxidant activity more than aqueous extract such as *Atriplex* sp*., S. nigrum* and *Z. album* (Tables 4 and 5). Furthermore, data's in Table 6 showed the antioxidant activity of ten fresh samples. It was observed that ethanolic extract from *P. guajava* possessed high antioxidant activity (97.3%), other three extract showed antioxidant activity more than 90% which include *C. limon, V. vinifera* and *C. annuum* (91.3, 90.3 and 90.5%, respectively). Five ethanolic extracts gave antioxidant activity more than 80% (*C. annuum, D. carota*, *F. carica, P. dactylifera* and *S. lycopersicum).* Different extracts from the tested plants have been previously evaluated for their antioxidant activity and results agreed with the findings that reported by Hassimotto et al. (2005) for *C. phelypaea, P. guajava* and *M. nitens* which gave the most active antioxidant against DPPH. *M. nitens* belongs to Cruciferae which has antioxidant activity as a result of glucosinolates as well as possessing a high content of flavonoids, vitamins and mineral nutrients (Moreno et al., 2006). The antioxidant activity of *G. glabra* extract has been reported also by Saxena (2005). In investigation by Trabelsi et al. (2010) extract from *L. monopetalum* exhibits antidysenteric properties against infectious diseases and antioxidant properties as a result of phenolic compound in these plant. *P. tortuosus* has antioxidant activity due to presence of flavonial glycosides, steroids and furanocoumarins (Abdel and Hafez, 1995). *O. europaea* showed antioxidant activity (Benavente-Garcٍa et al., 1999; Cِrcel et al., 2010) while *C. limon* besides its antioxidant activity (Hoyle and Santos, 2010), anticancer activity has been found (Silalahi, 2002). Aqueous extracts from *Z. album* and *V. vinifera* showed good results in scavenging DPPH and hydroxyl radicals (Khafagi et al., 2001). Antidiabetic activity of *V. vinifera* was reported (Şendogdu and Asalan, 2006). As the extracts are better soluble in aqueous media than are the synthetic antioxidants, they offer a promising alternative as food ingredients with antioxidant activity.

Our preliminary studies showed a good relationship between antioxidant efficacy of plant extracts and anticancer potency. All of the extracts which gave high anticancer potency have high antioxidant activity while the opposite trend is not. In this concern, cancer is a multistage process defined by at least three stages: initiation, promotion, and progression (Ames and Gold, 1992; Guyton and Kensler, 1993; Schulte-Hermann et al., 1990). Oxidative stress interacts with all three stages of this process. During the initiation stage, ROS may produce DNA damage by introducing gene mutations and structural alterations into the DNA. In the promotion stage, ROS can contribute to abnormal gene expression,

blockage of cell-to-cell communication, and modification of second-messenger systems, thus resulting in an increase in cell proliferation or a decrease in apoptosis of the initiated cell population. Finally, oxidative stress may also participate in the progression stage of the cancer process by adding further DNA alterations to the initiated cell population (Klaunig et al., 1998).

The encouraging results obtained from this screening work represent an important step towards the effective isolation, characterization of the active principles in these plants and to understand the mechanism of cytotoxic of these compounds. We also working plan to carry more biological activities including the *in vivo* studies thus; these plants could be as a source for new lead structures in drug design to combat cancer and natural antioxidants.

Conclusion

It has become clear that in Egypt many plants and herbs might provide effective anti cancer therapeutics. Such extracts should be more widely used in developing countries for prevention and treatment of dangerous diseases like cancer. The extracts should be considered as good sources for drug discovery.

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