

Biological activities and phytochemistry of tropical almond tree leaves extract from Gwadar, Balochistan (A Review)

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Abstract

The medicinal and traditional plants possess the properties to produce several types of chemical compounds which have big function in primary health care as healing medication. Tropical almond exhibited significant biological activities and have traditional uses for instance skin diseases, leprosy wounds, diabetes, high blood pressure, haemorrhoids, antioxidant, anti-clastogenic, anti-cancer characteristics, eye problems, travel vomiting, intestinal parasites, pyresis, diarrhea, dermatitis, Hepatitis, antimicrobial activity, anti-inflammatory, antifungal, antibacterial, Antioxidant, hepatoprotective, anti-indigestion, anti-dysentery, hepatoprotective, antisikling and diaphoretic, Anti-HIV Action, Wound healing Activity, Toxicology, Anti-aging. The phytochemistry of tropical almond revealed the presence of secondary metabolites for instance steroidal glycosides, phenolic compounds, alkaloids, flavonoids, triterpenes, saponins, phytosterols, tannins (terflavin A and B, corilagin, granatin B, geraniin, punicalagin, chebulagic acid, tergalagin, punicalin, and tercain), no. of flavanoids, rutin, isovitexin, isoorientin, vitexin and triterpenoids, humic acid, Punicalagin is the main tannin, fat, protein, carbohydrates, fiber, phosphorus, iron, arachidic acid, linoleic acid, myristic acid oleic acid, β -carotene, palmitic acid, ascorbic acid potassium, water, riboflavin, thiamin, stearic acid, palmitoleic acid as well as niacin, 2-prenylated benzoic acid, 2-prenyl-4-O- β -D-glucopyranosyl-oxy-4-hydroxybenzoic acid, protocatechuic and catechin, and mono unsaturated fats, terflavin A, and terflavin B, tergalagin, granatin, punicalagin, quercetin, chebulagic acid, gentisic acid, punicalin, corilagin, geraniin B, kaempferol as well as 1-degalloyl-eugenin.

Keywords: tropical almond, Biological activities, Phytochemistry

INTRODUCTION

The Therapeutic plants possess the properties to produce several types of chemical compounds which have big function in primary health care as healing medication and are western medicine alternatives too. The mechanism of action of these chemical compounds on human body is similar to drugs (Tapsell LC. et al 2006; Hashemzadeh-Cigari F et al.,2015; Ishola IO et al.,2014). Traditionally the medicines made from plants are the best source for infectious disease treatment and show minute risk as compared to the present artificial drugs (Dhankhar S et al. 2011). In plants the secondary metabolites show no. of important biological actions (De-Fatima A et al. 2006). These compounds are different from each other by biological action, structure, and mechanisms of actions. And these secondary metabolites comprise: glycosides, saponins, phenolic glycosides, phenols and flavonoids (Shahidi F. 2000; Shahidi F. et al. 2008). It has been demonstrated through various research works that the medicinal plants have verity of different constituent having antimicrobial and antioxidant characteristics in them being responsible for their advantageous health effects. They show satisfying results in the treatment of infectious diseases and compared to artificial antimicrobials they show less side effects (Lwu MW. et al.1999). The oxidative stress have a great role in the evolvement of chronic and degenerative illness which include cardiovascular,aging,cataract, rheumatoid arthritis, cancer, neurodegenerative disorders and autoimmune disorders (Willcox JK . et al. 2004; Pham-Huy LA. Et al. 2008). The natural source of antioxidant agents have become the special focus because they can save the human body from free radicals (Osawa T. et al. 1990; Houghton P.1995). The Phenolic compounds hold broad spectrum of biological impacts which are the scavenging of antioxidants and free radicals (Kahkonen MP. et al .1999; Pellati F. et al.2004).

Tropical almond is a tropical tree with medicinal properties which comprises great amount of the carbon-based substances, tannins (terflavin A and B, corilagin, granatin B,geranin, punicalagin, chebulagic acid, tergalagin,punicalin,and tercainin),no.of flavanoids,rutin,isorientin, vitexin and triterpenoids too (ursolic acid, 2 α , 3 β , 23-trihydroxyurs-12-en-28oic acid) and humic acid (Ahmed et al., 2005; Anand et al.,2015). Punicalagin is the main tannin in Tropical almond (Chen, 2000). Its extracts are helpful in decreasing heavy metal toxicity as well as has the ability to decrease water pH (Chyau et al., 2006) and is also good variety of nutrient also sterile interchange in the fish culture (Chansue & Assawawongkasem, 2008). The action of Terminalia catappa has been connected to the point that it comprises metabolites such as the steroidal glycosides, phenolic compounds, alkaloids, flavonoids, triterpenes,saponins, phytosterols and tannins (Cock, 2015; Divya et al., 2018).

Sections of the tree used for Medicinal purposes include seeds, leaves, fruits, stem and bark of the Terminalia catappa can be utilized for medicinal purposes, including antimicrobial, and antioxidant, high polyphenolic compounds such as tannins (Gordon et al., 2001). (H. V. Annegowda 2010; Chen et al 2006).

Various phytoconstituents have been determined in bark, fruits as well as in seeds of Tropical almond. Its fruit contains 12.03 gram carbohydrate, 1.95 gram

protein, including 1.21 gram ash. And huge level of β -carotene (2,090 μg) as well as vitamin C (138.6 mg) were found. The bark comprises cardiac tannins, glycoside, saponin, phenols, glycosides, steroid and volatile oils. Categorized in oleic-linoleic acid category, the lubricants consist high amount of fatty acids being capable of dissolving more substances, solely linoleic (more than 28.93%) as well as oleic (more than 31.48%) (Gao et al. 2004). In the southeast Asian countries, bark is utilized as a cure for dysentery (Barros et al., 2017).

The T. Catappa seeds comprise fat, protein, carbohydrates, fiber, phosphorus, iron, arachidic acid, linoleic acid, myristic acid oleic acid, β -carotene, palmitic acid, ascorbic acid potassium, water, riboflavin, thiamin, stearic acid, palmitoleic acid as well as niacin (Dukes, 2008; Mandloi S, et al. 2013). The seed consists of fixed stearin (46%), olein (54%), and oil (51.2%) The seeds provide 23.78% raw protein 4.13% moisture, 4.27% ash, 4.94% raw fiber, 16.02% carbohydrate and 51.80% fat; 548.78 kcal is the total calorific value (Gao et al. 2004). The nut is utilized in Taiwan Ayurveda medication for antibacterial and aphrodisiac actions (Cock, 2015). The intake of almond helps to reduce the heart related diseases in addition to its LDL and cholesterol-lowering effects are also handled. Thus eating of almond shows useful health task which features to the antioxidant action of vitamin E, the occurrence of phenolic compound like 2-prenylated benzoic acid, 2-prenyl-4-O- β -D-glucopyranosyl-oxy-4-hydroxybenzoic acid, protocatechuic and catechin, and mono unsaturated fats (Omenna EC et al., 2015).

The punicalagin (polyphenol) has been isolated in the leaves of T. catappa, including its derivatives, and other various compounds. The Tropical almond leaves have terflavin A, and terflavin B, tergalagin, granatin, punicalagin, quercetin, chebulagic acid, gentsic acid, punicalin, corilagin, geraniin B, kaempferol as well as 1-degalloyl-eugenin (Dukes, 2008) (Mandloi S, et al. 2013). Indian almond leaves contained Quercetin too. And the compounds which might be helpful for this plant to be utilized for traditional purpose are phytoconstituents including carotenoids, flavonoids, and phenolic compounds. (Dukes, 2008) (Mandloi S, et al. 2013).

The leaves are useful for handling skin diseases, leprosy wounds, diabetes, high blood pressure, and haemorrhoids (Barros et al., 2017; Rapha'el et al., 2019) The leaves were utilized for handling numerous diseases including leprosy, various kinds of cancer as they show antioxidant, anti-clastogenic, and anti-cancer characteristics and eye problems too (Ahmad MS et al., 2014). These leaves can be used to drop Travel vomiting as well as can be used to dispose of intestinal parasites, for preventing blood loss on the time of teeth removal (Ahmad MS et al., 2014). Tropical almond leaves are used in Asian counties to cure, pyresis, diarrhea, dermatitis and Hepatitis (Laisa P Silva et al., 2015) The antimicrobial activity is found in contradiction of *Staphylococcus aureus* as well as *Escherichia coli* in the chloroform tropical almond root extraction. Whereas the methanolic petroleum root ether extraction of tropical almond lacks antimicrobial function. There is very small restraint absorption (MIC) of 0.065 mg/ml in contradiction of *Escherichia coli* in the methanolic root squeeze of T. catappa. As well as chloroform squeeze show 0.4 mg/ml of MIC in contradiction of *Staphylococcus aureus* (Dukes, 2008) (Mandloi S, et al. 2013).

The Prioritized scientific name of Tropical almond is *Terminalia catappa* Linn. belonging from the family of Combretaceae (combretum family). Its Non-specific scientific names include the, *Terminalia procera* Roxb, *Terminalia moluccana* Lamk,

Terminalia mauritiana Blanco, *Phytolacca javanica* Osbeck (Thomson & Evans, 2006). Its common English Names include Tropical almond, Bengal, Indian, Malabar, Talisay and Singapore almond (Chyau et al 2006) as well as tropical beach, (Thomson & Evans, 2006). In height Tropical almond is about 25–40 m (82–130 ft.). Its trunk diameter becomes 50–150 cm (20–60 in) when it reaches maturity (Thomson & Evans, 2006).

According to Distribution and occurrence, the *Terminalia Catappa* L. family is a big tropical tree belonging to the leadwood family, combretaceae. This large tree has satisfying growth in tropical and subtropical climates. It is broadly grown all over the tropics. It mainly grows in the tropical regions of Australia, Africa and Asia as well as in some areas of the USA. It is mainly planted for ornamental intentions as well as for its eatable nuts. One can eat its nut kernel raw. In Ayurveda this tree is a well-known herb (Anand, 2015).

Taxonomic Classification of <i>Terminalia catappa</i> L.	
Kingdom	Plantae
Division	Angiospermae
Class	Dicotyledones
Order	Myrtales
Family	Combretaceae
Genus	<i>Terminalia</i>
Species	<i>catappa</i>

(Gayathri Segaran et al., 2019)

LITERATURE REVIEW

Terminalia is primarily a tropical and a sub-tropical genus related to the family of Combretaceae having two hundred and fifty (250) species found in West Africa; in its family, *Terminalia* is the second major genus (N. L. Edwin-Wosu et al., 2013). The generic name of tropical almond arises from the Latin word “terminalis,” which refers to that of the leaves teeming at the shoots end (Anand, 2015). Tropical almond the great, growing hierarchy is dispersed all over tropics in seaside surroundings. This tree has the ability to tolerate salt spray, somewhat high salinity in the root area and strong wind. This tree basically nourishes in properly, aerated and freely drained, sandy soils. It produces fruits at the age of 3 years, and its seed kernels can be eaten soon after the extraction *Terminalia catappa* L. is the suitable scientific name and Combretaceae (combretum family) is the family of this tree. (Shinde, 2007). Its seeds have got the similar taste as almonds. Because of which, in lots of the Countries this tree is famous to be known as Indian almond, tropical almond, wild almond, or sea almond (Barros et al., 2017; Rapha’el et al., 2019) Generally its height is of 35 m. Its fruits which can be eaten might be red in color when are ripened. According to the present study, the almond shell residue is a good source of lignin (Bartocci et al. 2019). The length of the leaves are 15–25 cm and the width is 10–14 cm, are ovoid in shaped, and are dark

green. The leaves fall in dry season when they become mature having pink reddish color. The fallen leaves have taken the interest of the researchers to extract energy from them (Shi et al. (2017).

The Terminalia Catappa L. species has customarily been prominent for coastal residents, granting a broad-spectrum of non-wood products and services. Its roots are fibrous and are spreading which have a great function in stabilizing the coastline. This tree is broadly grown all over the tropics, particularly at the grimy beaches, for gloom, decorative drives, and for eating its hard dry fruits. From ligneous the hardwood is obtained which is decorative and very useful to convert it into furniture as well as internal building timbers (Shinde, V., Dhalwal, K., Mahadik, and K.R.2007).

In Caribbean area, this tree is also recorded in pharmacopeia vegetables, where the leaves were utilized in a refinement for infections such as urinary and gastric (Laisa P Silva et al.,2015) In the leaf ,stem and root parts of tropical almond the acid and prenylated benzoic acid are present(Omenna EC et al.,2015)(Omenna EC et al.,2015) The fruit comprises antiasthmatic compound, cyanidin 3-glucoside, corilagin, ellagic acid and xanthine oxidase inhibitor The gum comprises mannose (1%) ,D-galactose (20%),uronic acids (19%), Larabinose (59%) and xylose (1%)(Sharma R et al.,2017).

The anti-inflammatory, Antioxidant, hepatoprotective activities were investigated tropical almond and antidiabetic characteristics were usually found in the fruit part(Fan YM et al.,2004 ; Katiki LM et al.,2017). Aphrodisiac, anticanceras well as anti-HIV reverse transcriptase were also investigated that are present in this tree (Sharma R et al., 2017) .

Because of having large volume leaves, its leaves fall frequently; its dry leaves are excess elements which can provide many other valued products. These environmental discarded materials can be processed in the Thermochemical procedures . Likewise other uses such as adsorption (Canlas et al. 2019; Hevira, Munaf, and Zein 2015; Sathishkumar et al. 2015; Arasaretnam and Karunanayake 2010).

Its bark and fresh leaves are usually utilized because of having the effects of anti-indigestion, anti-dysentery, hepatoprotective, antisikling and diaphoretic (Coode MJE.1973) (Lehmer J.et al. 2005) (Young M et al.2000) (Rawlings ND. et al. 2008) (Bernanke JM. Et al. 2008). The young leaves aqueous extract is utilized against colic and headache (Morton JL.1985) and the bark is utilized as an astringent in thrush and dysentery (Lex AJT et al. 2006). It has been reported that the seed oil has anti-inflammatory, antifungal, Antibacterial, analgesic, antihyperalgesic and anticolic characteristics in it (Federspil P. et al. 2007)(Pollack M. et al. 2000). The fallen leaves have taken the interest of the researchers to extract energy from them (Shi et al. (2017). The fruit is a good source of tannic acid which could stain sidewalks, pavement and cars. It also creates important litter on the surface area of ground (Gilman, E.F., Watson, and D.G.1994). The fruit of T.Catappa comprises tannin, glucose, corilagin pentosans, cyanidin-3-glucoside, brevifolin carboxylic acid, ellagic acid, gallic acid, together with β -carotene (Mininel et al.2014). The Investigation out tropical almond also reveals the effectiveness of the extract in the decrease of fasting glucose level in blood, low serum cholesterol, , serum urea, low density lipoprotein and serum triglycerides (Ahmmed, 2005). It has been investigated that the Terminalia catappa leaves have the capability to recover fish health against pathogens attack (Yunus et al., 2019). For instance, it secure tilapia against Aeromonas hydrophila and ectoparasites of

tilapia, decrease the fungal infection in the eggs of tilapia (Chitmanat et al., 2005) and better the growth as well as the existence rate of *Penaeus monodon* post larvae prawns (Ikhwanuddin et al., 2014). It played a role to enhance the survival and performance of larvae of Amazon fish (Ramos et al., 2020) and also better the existence and growth of *Betta sp* against *Aeromonas hydrophila* bacteria (Nugroho et al., 2017). Indian almond can be useful in tilapia fish (*Oreochromis niloticus*) culture to safeguard fish against pathogens attack (Nugroho et al., 2016; Yunus et al., 2019).

Antibacterial Activity

An effort has been conducted on antibacterial action of Tropical almond Leaves, the distinctive phases are removed with the help of water which were utilized in contradiction of different unsafe microbes and observed the characteristic of *Terminalia catappa* leaves of being able to be active against different organisms (Akharaiyi FC. et al, 2011).

Different levels of activities are shown against *Candida tropicalis*, *Pseudomonas testosteroni*, *Streptococcus agalactiae*, *Pseudomonas pseudoalcaligenes*, *Staphylococcus epidermidis*, *Klebsiella pneumoniae*, *Staphylococcus subflava*, *Streptococcus faecalis*, *Micrococcus flavus*, *Proteus morgani*, *Bacillus subtilis*, *Proteus mirabilis*, *Bacillus megaterium*, *Bacillus cereus*, *Citrobacter freundii*, *Enterobacter aerogenes*, *Alcaligenes faecalis*, *Proteus vulgaris*, *Escherichia coli*, *Streptococcus cremoris*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Salmonella typhimurium* through aqueous and methanolic extractions of Tropical almond leaves. The more effective extract of Tropical almond leaves was methanolic as compared to aqueous extraction in the studied microbial strains obstruction (Pawar SP, Pal SC. 2002). It has been determined that the Tropical almond leaves contain the high amount of tannin ingredients also have the ability in preventing particular phenotypic appearance of quorum detecting in the certain investigation strains (Taganna JC. Et al. 2011).

Antifungal Activity

It has been determined that the antifungal activity is shown against *Aspergillus Niger*, *Trichophyton tonsurans*, *Penicillium chrysogenum*, and *Curvularia lunata* by the methanolic extract of *T. Catappa* (Nair R, Chanda S. 2008) (Mandloi S, 2014).

Antioxidant Activity

Phenolic compounds found in plants act as great antioxidants, that can keep safe the cellular arrangement from free radicals by performing as hydrogen donors and radical scavengers (Chew et al., 2011). Antioxidants function as free radical scavengers and are thus to moderate the outcome of oxidative stress in a multiplicity of diseases like Parkinson's disease, cardiovascular diseases, cancerogenesis, Alzheimer's disease, nephrotoxicity, Neuro-degenerative, ageing and the diabetes (Pukumpuang et al., 2012). In the leaves and fruits of *Terminalia Catappa* linn, the antioxidant property has been testified (Fan YM et al., 2004; Katiki LM et al., 2017; H.V. Annegowda et al., 2010).

Anticancer Activity

The cancer takes place due to the invasion, metastasis and the rapid growth of uncontrolled cells which may happen at any tissue of the where it can spread into its nearby as well as far distant tissues (Shokoohinia et al., 2018; Hanahan D et al., 2011). Prostatic cancer is the second most common cancer in men (Daniyal et al., 2014). It has been investigated that Terminalia Catappa Linn leaves extracts have got the ability in the treatment of Prostatic cancer (PC3 cell line) it showed the anti-proliferative action in LNCap about 50%. (Fort, R et al., 2018).

Cervical cancer is the fourth most common one in women (Small W Jr. et al., 2017; Bray et al., 2018) 1;2. According to the report of World Health Organization, in 2018 about 570,000 of women were detected with cervical cancer and about 311,000 passed away from this cancer worldwide (The Global Cancer Observatory, 2020). The medicinal tree T. catappa has been proven to be capable in the healing of the cervical cancer through its leaves extract going under processes (Lee et al., 2019).

The T. Catappa leaves extracts did show the antimetastatic effects on lung cancer metastasis both in vitro and in vivo methods (Chu SC et al., 2007; Nagappa AN et al., 2003). The T. Catappa leaves also showed effective results in the inhibition of hepatocellular carcinoma (HCC) Huh7 cells the liver cancer (Yeh CB et al., 2012).

Anti-inflammatory Activity

In recent times, superior significance has been assumed to the function of inflammation in the pathogenesis of numerous diseases. Therapeutic plants are utilized as a source of medication for numerous inflammatory complaints worldwide. The numerous triterpenoids, polyphenolic compounds, including other various chemical compounds originate in the plants might have anti-inflammatory properties (Anand et al 2015).

Terminalia Catappa tree has been broadly used to cure no. of different kinds of diseases through conversion into both traditional as well as modern medicine as anti-inflammatory agents (Fan et al 2004), against cancer disease (Yang et al 2010; Chu et al 2007; Zhai et al 2001) antifungal (Goun et al 2003) agents that inhibit oxidation (Kinoshita et al 2007; Masuda et al 1999). In aquaculture its greeneries were utilized to heal lesion (Chansue et al 2004) in contradiction of fungal infection, infection caused by bacteria (Chitmanat et al 2005) and parasitic infection too (Chansue & Tangtrongpiros 2005). The solution of Tropical almond leaves provides hydrolyzable tannin after submerged into aquatic medium like water. The Tannins comprise characteristics against bacteria (Chung et al 1998). Tannic acid make bond strongly with calcium and metallic ions to prevent nourishment of bacteria found in the intestine (Chansue & Assawawongkasem 2008).

Antidiabetic Activity

The chronic disease Diabetes Mellitus (DM) occurs through inheritance and also due to the acquired deficiency in the formation of insulin by pancreas or may occur by the ineffective insulin production in the body which increases glucose concentration in the blood that harms the systems of the body especially effects the nerves and blood vessels. According to the researchers the T. Catappa leaves extracts show the antidiabetic activity. The study was carried out on the aqueous and cold extracts of the leaves of Terminalia Catappa L. in which alloxan made diabetic rates were put in observation through fasting the levels of blood sugar and through the serum

biochemical examination .Almost all of the Tropical almond extracts manufactured a considerable amount of anti-diabetic property at one fifth (1/5th) dose level of their fatal doses.(Ahmed et al.,2005).

Anti-HIV Activity

HIV the human immunodeficiency virus that infects and destroys the functions of the immune system cells. According to the report of World Health Organization, each year nearly two million people pass away from HIV.The efforts are made to investigate plant based natural treatment for HIV as the studies have proved that the plants have got the ability to cure HIV infection. In the study the T.Ctappa was investigated and proved to have anti-HIV characteristics in it (Dwevedi A et al.,2016). In the studies , from the bark,leaves ,fruits, and seeds of Indian almond ,the compounds such as hydrozizable ellagitannin ,flavonoids as well as some other tannin compounds were isolated .Numerous such phytochemals were studied to inhibit the replication of HIV infected H9 lymphocyte containing cytotoxicity to some extent.It was confirmed through many of the Pharmacological investigations that the Indian almond leaves ,fruits and bark contain the anti-HIV reverse transcriptase (RT) activities(Valsaraj R et al., 1997; Martino VS et al.,2002; Tshikalange TE et al., 2008; Maregesi S et al., 2010).

Toxicology

A study was carried out on the crude aqueous extract of Terminalia catappa L. (0.5/kg, 1.0 g/kg, and 3.0 g/kg) in which by the toxic occurrence the primary toxicity and by the nutritional behavior including the physiological examination the secondary toxicity were determined about 14 days of the treatment duration.Durring the experiment no rat deadliness was detected .Both the nutrional behavior as well as the physiological conditions of the rats were examined normal.(Azrul et al., 2013).

Wound healing Activity

Wound can be defined as the loss of cellular as well as the functional capability of the alive tissues. Many of the therapeutic plants have got the ability to heal wounds and Terminalia Catappa is one of them. It was studied that the Terminalia Catappa Cream showed 97% decrease in the wound place when was applied on the wound as compared to the control(81%) and betadine cream as the standard drug.The results indicated the impressive wound treatment activity of the bark extracts of the Tropical almond (Khan AA et al.,2014) . T. catappa cream makes the epithelization quicker which advocates that the extracts of bark encourages great wound-healing function (Anand et al.,2015).

Anti-aging

According to the researches the Hydrophilic extract of Terminalia Catappa has DPPH-free radical scavenging property as well as saves erythrocytes from the hemolysis made by 2,2'-Azobis(2-amidinopropane) dihydrochloride (AAPH).About 10-500 µg/mL of T.Catappa obstruct the collagenase action in 82.3% to 101.0% dose-dependent routine .Further more about 25µg/mL of tropical almond prevent the expression of MMP-1 as well as MMP-9 protein and about 50µg/mL of T. catappa prevent the expression of MMP-3 protein. The Tropical almond supports the type I procollagen protein expression .Tropical almond reduced the expression of MMP-1, MMP-3, and MMP-9 by

stopping the phosphorylation of JNK, p38 and ERK. That's why it could be utilized as the antiaging component(Wen KC et al.,2011).

CONCLUSION

The Tropical almond tree has been selected wisely to study its leaves extract medicinal potential by keeping in view the previous literature review on it. According to the previous studies the species Terminalia Catappa L. has the ability in the treatment of numerous diseases whether it is an infectious disease such as caused by bacteria or fungi, Viral disease caused by a typical virus i.e. HIV disease or a cancer disease including lung cancer, liver cancer, cervical cancer, prostatic cancer, and the like. The studies also proved that the tropical almond not only help human beings but also helped to cure other organisms too such as it helps the fish(Nile Tilapia) to get cured from the pathogenic illness. Besides having medicinal potential tropical almond has many other beneficial properties in it. Such as it helps in making dyes, play role in the growth and survival of the fish and the like. The parts of the tree that have medicinal potential almost include the whole tree such as its leaves, bark, nuts, stem, root and fruits has been used in the preparation of medicines in the world especially in the tropical regions including India. However in this study the leaves extract, part of Tropical almond used for examination, did provide satisfying results as it was supposed to. The methanolic, n-hexane and Distilled water extracts result regarding anticancer action i.e. MTT PC3 and MTT Hela, represented the values less than 50% non-cytotoxic, the n-hexane extract showed good antifungal result only against Trichophyton rubrum. The reason behind the fact that the results were not found effective could be the soil composition of the Gwadar main city region, or the environmental change or water nature or any other factor.

RECOMMENDATION

As it is mentioned above in literature review that there are nearly 250 species of Tropical almond, a study is required to keep the record of the species found in Gwadar city, Balochistan. Furthermore, Balochistan is the region that is rich in medicinal plant sources which is advantageous for its native people not only on pharmaceutical point of view but also economically. In order to explore the medicinal potential found in the medicinal plants, Balochistan requires the advanced technological apparatus along with required materials as well as the experienced expertise to contribute to brighten the future of Balochistan.

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