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A Miracle Plant for the Herbal Pharmacy; Henna (*Lawsonia inermis*)

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Abstract: *Lawsonia inermis* is a plant that is widely distributed across the Sahel and Central Africa. It also exists in the Middle East. It is a much-branched glabrous shrub or small tree of about 2-6 m high, which may be spiny. *Lawsonia inermis* plant is cultivated in Africa and Asia for both medicinal and industrial (dyeing) purposes. Just as people use it for staining hair, nails and beard, it is pointed that *Lawsonia inermis* is used for various fields in medicine. Hepatoprotective and immunomodulatory effect, antimicrobial, anthelminthic, antifungal, antitrypanosomal, abortifacient, antioxidant and anticancer activity of *Lawsonia inermis* were reported from all over the world by previous studies. The early studies about *Lawsonia inermis* against to Ehrlich Tumors in mice in Turkey were started by Dr. Emin Zümrütdal from Adana Numune Training and Research Hospital and his colleagues at University of Cukurova Adana, Turkey. This study aimed to review the available literature on some of the ethno-botanical uses of seeds, leaves and roots of *Lawsonia inermis* plant.

Key words: Ayurveda, herbal remedy, antioxidant, alternative medicine, anticancer

INTRODUCTION

Lawsonia inermis Linn. (Lythraceae) is a very useful medicinal plant in all parts of the world. The leaf powder of henna sap is used for staining hair, nails and beard (Chengaiah *et al*., 2010). The leaves of *Lawsonia inermis* are used to treat poliomyelitis, measles among the Yoruba tribe of South Western Nigeria (Oladunmoye and Kehinde, 2011). The seeds of henna have been reported to possess deodorant action and are used in most cases of gynecological disorders such as menorrhagia, vaginal discharge and leucorrhoea (Nawagish *et al*., 2007). The leaves of *Lawsonia inermis* with those of *Hibiscus rosa-sinensis*, *Eclipta prostrata* and seeds of *Abrus precatorius* when they are taken in equal quantities and ground into paste which is soaked in sesame oil for 5 days is used as hair oil by the tribes of Andra Pradesh, India (Suneetha *et al*., 2011). In Turkey, henna which is an extract of *Lawsonia* sp. is used as hair dye and nail dye in many cultures as decorative dye centuries (Ozaslan *et al*., 2009). Henna is widely used in the cosmetic industry as dyeing agent also in India (Chengaiah *et al*., 2010). Reports show that methanolic root extracts of *Lawsonia* is used in Nigeria for cosmetic purposes, as antimalarial (Idowu *et al*., 2010) as well as for abortifacient purposes (Aguwa, 1987). The powdered roasted seed is mixed with gingerly oil to make a paste which is used for the treatment of ring worm. Decoction of the leaves is used for aseptic cleaning of wounds and healing (Kumari *et al*., 2011). *L. inermis* is also used by some individuals as 'blood tonic', thus implying its multifaceted use (Idowu *et al*., 2010).

Lawsonia inermis plant is a much-branched glabrous shrub or small tree of about 2-6 m high, which may be spiny. Young branches are quadrangular and green but these branches turn red with age. The leaves of *L. inermis* are opposite, entire, sub-sessile, elliptic to broadly lanceolate, 1.5-5×0.5-2 cm, glabrous, acuminate; while veins on the upper surface are depressed. The flowers are small, white, numerous in large pyramidal terminal, fragrant, 1 cm across with 4 petals crumpled in the bud. The calyx has 2 mm tube and 3 mm spread lobes; the petals are orbicular to ovate, white or red; it has 8 stamens, inserted in pairs on the rim of the calyx tube; the ovary is 4 celled and the style up to 5 mm long, erect. The fruits are small, brown, globosely capsules 4-8 mm in diameter, many-seeded, opening irregularly, split into 4 sections with a persistent style. The seeds are 3 mm across, angular and possess thick seed coat. The specific epithet means unarmed or without spines. *L. inermis* plant is widely distributed across the Sahel and Central Africa. It also exists in the Middle East (Orwa *et al*., 2009). It grows mainly along waterways and in semi-arid regions and is adapted to a wide range of environmental conditions. It can withstand low air humidity and drought conditions. The seeds of henna plant require high temperatures for germination, growth and maximal development (Orwa *et al*., 2009).

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This study aimed to review the available literature on some of the ethno botanical uses of seeds, leaves and roots of *Lawsonia inermis* plant.

ETHNO BOTANICAL SURVEY

A research was carried out to study the diversity of the medicinal flora of the Almora district of the Central Himalaya in the state of Uttarakh and in India. This study presented the distribution and traditional uses of the 188 medicinal flora representing 80 families, in which 35 species were trees, 112 were herbs, 35 were shrubs and 6 were climbers. These identify the plants that need conservation and protection. Various parts, such as: whole plant (55), roots (47), fruits (32), stem (11), leaves (41), barks (23), inflorescence (2), rhizome (6), bulbs (8), latex (3), seeds (32), flowers (14) and oil (5) were used in different ailments (Kumari *et al*., 2011).

An ethno botanical survey carried out by researchers in South Western, Nigeria and it showed that majority of people, about 7.41% of the respondents make use of *Lawsonia inermis* leaves as an antimalarial. And also, the survey showed that most people have preference for the aqueous extract of *L. inermis* (Idowu *et al*., 2010).

PHYTOCHEMICAL INVESTIGATION

Few phytochemical studies have been carried out on the seeds. However, there has been no report on the standardization of henna seeds. In view of the ethno pharmacological use, preliminary pharmacognostical standardization of *L. inermis* seeds was carried out. The present report shows that the seeds have typical pyramidal shape and are dark brown in color. The average dimensions of the seed were 1.51 mm (thickness)×2.202 mm (length)×1.887 mm (width). The powder was odorless and had a bitter taste. The transverse section of the seed showed 2 or 3-layered yellowish brown testa, a thick endosperm and small embryo. Successive extractive value was the highest in case of the aqueous extract. Percentage mean ash values were 3.056 (total), 0.76 (acid insoluble ash) and 0.84 (water soluble ash). Loss on drying was 9.09%. The average pH of the aqueous extract was 7.04. Seeds had a bitterness value of 125, a foaming index of 1080 (units g^{-1}), resins (5.53%) and fixed oil content was 1.429%. Screening of alcoholic and aqueous extracts indicated the presence of carbohydrates, protein, phenolic compounds and triterpenoids (Nawagish *et al*., 2007).

The phytochemical screening of the aqueous and ethanol extracts of the leaves of *Lawsonia inermis* revealed the presence of alkaloids, carbohydrates, resins, saponins, sterols and tannins in different composition in the aqueous extract, fractions of ethanol extract and fractionation residue of the leaves in Nigeria (Kawo and Kwa, 2011).

GC/MS analysis showed that the essential oil of the leaves of *Lawsonia inermis* L. (henna) had thirty-six components which constituted 80.4% of the oil. The major components were ethyl hexadecanoate (24.4%), (E)-methyl cinnamate (11.4%), isocaryophyllene (8.1%), (E)-beta-ionone (5.8%) and methyl linolenate (4.1%) (Oyedeji *et al*., 2005).

ABORTIFACIENT ACTIVITY

In a research which was done by Aguwa (1987), the methanolic root extracts of *Lawsonia inermis* were studied for abortifacient activity. The results indicated that the methanolic extracts were very effective in the induction of abortion in mice, rats and guinea pig. The observed effect was dose-dependent. Further this confirmed its ethno medicinal use in the procurement of abortion in humans in some parts of Nigeria.

CHEMICAL COMPOSITION

In a study, the nitrogen content was measured by the Kjeldahl technique. The results showed that the leaves had a level of Ca, Na, P and K contents, ranging from 0.2 to 4%. The Mg content was less than 0.2% while Cu, Zn and Fe contents were above 0.5, 1.1 and 15%, respectively, Mn content was less than 1.5% while the Nitrogen Matter (NM) content was less than 1.5%. In the stems, P and K contents were respectively, above 5.12 and 0.5%, Mg content was less than 0.08%, while Na and Ca contents were less than 0.2%. Cu, Zn, Fe and Mn contents were less than 0.95, 1.7, 4 and 0.5%, respectively and NM contents were less than 0.2% (Boubaya *et al*., 2011).

CHEMICAL INHIBITION

The aqueous extract of the leaves of henna (*Lawsonia*) has also been tested as corrosion inhibitor of carbon steel, nickel and zinc in acidic, neutral and alkaline solutions, using the polarization technique (El-Etre *et al*., 2005). *Lawsonia inermis* plant is cultivated in Africa and Asia for both medicinal and industrial (dyeing) purposes (El-Etre *et al*., 2005). The result showed that the extract acts as a good corrosion inhibitor for the three metals in all tested media. El-Etre *et al*. (2005) postulated that the degree of inhibition depended on the nature of metal and the type of the medium used. For steel and nickel, the inhibition efficiency increased in the order: alkaline

<neutral < acidic, while in case of zinc, it increased in the order: acid <alkaline <neutral, thereby reconciling with the observed concept of the *Lawsonia inermis* extract being a mixed inhibitor. The inhibitive action of the extract was discussed in view of adsorption of the complex *Lawsonia inermis* molecules onto the metal surface. El-Etre *et al.* (2005) found that this adsorption followed Langmuir adsorption isotherm in all tested systems. The authors also proposed that the formation of a complex between the metal cations and Lawsone (2-hydroxy-1,4-naphthoquinone) was an additional inhibition mechanism of steel and nickel corrosion.

The extract of henna leaves as environmentally friendly corrosion inhibitors of metals was also investigated by Al-Sehaibani (2000). The water extracts of henna, (*Lawsonia inermis*) leaves powder were investigated for their corrosion inhibitory ability on steel and commercial aluminum in saline, acid and alkaline water. The maximum efficiency was attained by just 20 g L^{-1} of the extract. The inhibition efficiency of mild steel corrosion in HCl by the extract was 96% and that of aluminum in NaOH was up to 99.8% and no inhibition was observed for steel and aluminum in NaCl solution. Rehan (2003) conducted a research on the effect of water extracts from dry leaves of some economic plants, date palm (*Phoenix dectylifera*), henna (*Lawsonia inermis*) and corn (*Zea mays*) on the corrosion inhibition of commercial grade metals; steel, aluminum and copper in acidic chloride and sodium hydroxide solution using the weight loss, solution analysis and potential measurements. The inhibition action was found to critically depend on the metal type and solution composition. Only date palm and henna extracts were found to be highly effective in reducing corrosion rate of steel in acidic chloride solution and aluminum in sodium hydroxide solutions. The inhibition efficiency increased with increasing concentration of the extract. The inhibition was interpreted in terms of chemisorption of some active ingredients in the leaves according to Temkin isotherm (Buchweishaija, 2009).

ACUTE TOXICITY STUDIES

A study was carried out by Mudi *et al.* (2011) to determine the lethal dose of the aqueous root extract of *Lawsonia inermis* in Wistar rats to ascertain its safety. Five groups of rats (4 rats per group; including two pregnant females) were administered intraperitoneally (i.p.) doses of the stock aqueous root extract (0.3 g mL^{-1}) volumes corresponding to 200, 400, 800, 1200 and 1600 mg kg^{-1} Body Weight (b.wt.). Various clinical symptoms (physiological changes) like dizziness, loss of appetite, partial paralysis, temporary amnesia and spontaneous abortion in the included pregnant females; were visibly observed in groups treated with 800-1600 mg kg^{-1} b.wt., while groups with 200-400 mg kg^{-1} b.wt. and the control remained active and healthy. No mortality was recorded in all of the groups. The results indicate delayed toxicity after intraperitoneal administration of the extract at various concentrations. It shows that intraperitoneal administration of the aqueous root extract of the *L. inermis* though active in inducing spontaneous abortion is slightly toxic and as well as safe for therapeutic purposes within the dose range (Mudi *et al.*, 2011).

A study by Abdelgadir *et al.* (2010) was concluded that there was a significant toxicity for male Wistar rats administered orally with *Lawsonia inermis* seeds at concentrations of 78.57, 392 and 785.7 mg kg^{-1} day^{-1} and damage of vital organs exemplified by necrosis, fatty changes, hemorrhage and congestion. However, the extract was not fatal when given at these concentrations. While, a dose of 78.57 mg kg^{-1} day^{-1} of the extract caused less organ damage and obvious changes on sero-biochemical parameters (Abdelgadir *et al.*, 2010).

HEPATOPROTECTION ACTIVITY

This study was aimed to assess the hepatoprotective activity of 90% ethanol extract of *Lawsonia inermis* and its ethyl acetate fraction. *Lawsonia inermis* L. seeds on carbon tetrachloride (CCl_4) induced hepatotoxicity in rats and to ascertain the claim of its use in liver disorders. Pre-treatment of rats with doses of 200 and 400 mg kg^{-1}, b.wt. (p.o.) of the ethanol extract and its ethyl acetate fraction significantly ($p<0.05$) lowered serum transaminases (AST and ALT), Alkaline Phosphatase (ALP), Total Bilirubin (TB) and caused an increase in the levels of the Total Proteins (TP) and albumin (ALB), respectively, in a dose dependent manner against the significant ($p<0.01$) alteration of these damaged marker enzymes when challenged with CCl_4 (0.5 mL kg^{-1}, i.p.). Parallel to these changes, the seeds extract and its fraction prevented CCl_4 induced oxidative stress by significantly restoring the levels of reducing glutathione and lowering the levels of hepatic malondialdehyde by inhibiting the production of free radicals. These biochemical parameters were supplemented by the histopathological examination of liver sections. These findings suggest that ethyl acetate fraction has a more significant ($p<0.05$) hepatoprotective effect against CCl_4 induced hepatotoxicity in rats and confirms the folklore use of this plant. The ethyl acetate fraction (400 mg kg^{-1}) of ethanol extract of the seeds of *Lawsonia inermis* exhibited a

significant ($p<0.05$) hepatoprotective effect against CCl_4 induced liver damage (Chaudhary *et al*., 2012) may be due to the presence of flavonoids which are hepatoprotective and inhibition of lipid peroxidation inhibitory properties (Tapas *et al*., 2008).

ANTIMICROBIAL ACTIVITY

In a study, clinical isolates of *Streptococcus* sp., *Staphylococcus aureus, Pseudomonas aeruginosa, Candida albicans, Fusarium oxysporum* and *Aspergillus niger* were treated with extracts of the leaves of *L. inermis* for antimicrobial activity using *in vitro* agar incorporation method and well diffusion methods, respectively. Results showed that the henna leaves extracts were able to inhibit the growth pattern of *A. niger* and *F. oxysporum*. *Streptococcus* sp. and *S. aureus* were also inhibited by the extracts. Inhibition of the microorganisms' growth suggests that henna may be a valuable tool in the management of burnt wound infections (Muhammad and Muhammad, 2005).

In a related study, three medicinal plants *Aegle marmelos*, *Lawsonia inermis*, and *Albizia lebbeck* were extracted by Soxhlet apparatus using petroleum ether, ethanol, chloroform and water as solvent. Among those extracts, the petroleum ether was considered as the most effective. The extracts were subjected to preliminary phytochemical screening and the three plants with four extracts were tested against three Gram positive bacteria (*B. cereus*, *B. subtilis*, *S. aureus*) and three Gram negative bacteria (*E. coli, P. vulgaris* and *P. aeruginosa*) by disc diffusion method. Maximum inhibition (3.8 cm) was recorded in *Lawsonia inermis*. It also showed inhibitory action against all the six pathogen tested. The zone of inhibition of the extracts was compared with the standard antibiotics streptomycin and spectinomycin. (Sudharameshwari and Radhika, 2007).

Habbal *et al*. (2011) conducted a study in which crude extracts of fresh and dry leaves and seeds of *Lawsonia inermis* were investigated for their antimicrobial activity against 3 standard bacterial strains namely: *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa*. Eleven different bacterial strains were obtained from patients attending the Sultan Qaboos University Hospital, Muscat, Sultanate of Oman. In addition, one *Candida albicans* (*C. albicans*) species were used for testing the antifungal activity of the Omani henna sample. All fresh and dry leaves and seeds of the Omani henna demonstrated antibacterial activity against all the 3 standard strains and the 11 patients' isolated strains. Henna dry leaves demonstrated the best *in vitro* antimicrobial activity and in particular against *Shigella sonnei*. However, henna fresh and dry seeds showed no activity against *C. albicans*. The study indicates that Omani henna possess *in vitro* antibacterial activity against a wide spectrum of bacterial strains and *C. albicans* (Habbal *et al*., 2005).

THE USE OF HENNA IN ANTI HELMINTHIC PURPOSE

The development of anthelmintic resistance and the high cost of conventional anthelmintic drugs led to the evaluation of medicinal plants as an alternative source of anthelmintic. In the current study under review, *in vitro* experiments were conducted to determine the possible anthelmintic effects of crude aqueous and hydro alcoholic extracts of the leaves of *Chenopodium ambrosioides, Lawsonia inermis* and seeds of *Jatropha curcas, H. contortus*'s eggs and adult. Both extracts of *C. ambrosioides* and *J. curcas* inhibited the hatching of eggs at a concentration less than or equal to 2 mg mL^{-1}, while the effect of *L. inermis* was not dose-dependent and did not inhibit the hatching of eggs of *H. contortus,* significantly, at all tested concentrations. Based on their ED_{50}, the two most potent extracts using egg hatch assay were the hydro alcoholic extract of *C. ambrosioides* (0.09 mg mL^{-1}) and the aqueous extract of *J. curcas* (0.1 mg mL^{-1}) in a decreasing order of potency. With regard to the effect of extracts on the survival of adult parasites, extracts from *C. ambrosioides* have shown a moderate effect while *J. curcas* and *L. inermis* have shown no statistically significant effect on the survival of adult parasites at the concentrations tested and the few mortality cases recorded were not dose-dependent ($p<0.05$). The overall findings of the study showed that *C. ambrosioides* and *J. curcas* contain possible anthelmintic compounds and further evaluation of the two plants should be carried out (Tadesse and Mirutse, 2009).

ANTI TRYPANOSOME

The *in vitro* and *in vivo* antitrypanosomal activity of the leaf of *Lawsonia inermis* was investigated by Wurochekke *et al*. (2004). The crude methanolic extract had *in vitro* activity against *Trypanosoma brucei* at concentration of 8.3 mg mL^{-1} of blood while *in vivo* study shows that the treatment tends to ameliorate the disease condition but did not affect the level of parasitaemia and pack cell volume.

ANTIFUNGAL ACTIVITY

Methanol extracts of five plants were tested for their antifungal activity against 10 phytopathogenic fungi and

Candida albicans B017. Among all extracts tested, *Lawsonia inermis* showed the greatest percent inhibition of mycelial growth of target fungi (76.47-87.77%) followed by *Withania somnifera* (54.44-78.88%). The protein fractions of *Lawsonia inermis* and *Withania somnifera* exhibited four to five times more percentage inhibition of mycelial growth of *Bipolaris oryzae* and *Colletotrichum lindemuthianum* than the nonprotein fractions. The active compounds were proteinaceous in nature or proteins and they were effective against plant pathogens (Khan and Nasreen, 2010).

STAINING (G POSITIVE)

Aqueous (cold and hot) and ethanol extracts solutions of the henna plant (*Lawsonia inermis*) leaves was adapted for the first time as a counter stain in Gram staining reaction. In a study conducted by Chukwu *et al.* (2011), different extracts of *L. inermis* leaves were formulated into various staining solutions of different concentrations and modified with hydrogen peroxide, ferric chloride, potassium alum and potassium permanganate. These staining solutions were used to stain both standard Gram positive and Gram negative bacterial isolates using Gram staining technique. The experimental henna plant extracts solutions were used with usual counter stains (neutral red, safranin and dilute carbol fuchsin) as positive controls. Phytochemical analysis of the extracts revealed the presence of tannin (hennotannic acid or Lawsone) and saponin. The aqueous extracts of the henna plant (cold and hot) oxidized with potassium permanganate (pH 7.00-7.16) gave a better staining reaction with Gram negative bacteria, while the ethanol extract oxidized with potassium permanganate (pH 6.55) had no staining reaction with Gram negative bacteria. Hence, the aqueous henna leaves extracts (cold or hot) when oxidized with potassium permanganate could be used as a substitute for the usual counter stains used in Gram staining procedure (Chukwu *et al*., 2011).

ANTIOXIDANT ACTIVITY

A study was conducted to investigate the free radical scavenging and reducing power of *Lawsonia inermis* L. seeds by determining the antioxidant activity, total phenolic and flavonoid content of Petroleum Ether extract (PE), Dichloromethane extract (DCM), Ethanol extract (ET) and aqueous extract (AQ) of henna seeds. In all the assays carried out, ET showed a greater potential to scavenge DPPH radical, reduce MO (VI) to MO (V) complex and Fe (III) to Fe (II) and to inhibit lipid peroxidation. The IC_{50} of ET was far greater than that of the standard, ascorbic acid (AS) in the lipid peroxidation assay. The activity of AQ was lesser then when compared with that of ET but greater than PE and DCM. The phenolic and flavonoids were present in higher amounts in ET followed by AQ. Trace amounts of phenolic were detected in PE and DCM, but the amount of flavonoids were below the detection level. The study showed that the antioxidant activity and the concentrations of phenolic and flavonoids are proportionate to each other. Philip *et al.* (2011) concluded that the ethanolic extracts of henna seeds are efficient antioxidants.

IMMUNOMODULATORY EFFECT

The immunomodulatory bioassay-guided fractionation of the methanolic extract of henna (*Lawsonia inermis* L.) leaves resulted in the isolation of seven compounds; three were been isolated for the first time from the genus, namely p-coumaric acid, 2-methoxy-3-methyl-1,4-naphthoquinone and apiin, along with the previously isolated compounds: lawsone, apigenin, luteolin and cosmosine. Structural elucidations of the isolated compounds were based upon their physical, chemical as well as spectroscopic properties. Their immuomodulatory profile was studied using an *in vitro* immunoassay, the lymphocyte transformation assay. The ABTS [2,2-azino-bis (3-ethyl benzthiazoline-6-sulfonic acid)], free radical scavenging assay depicted that all isolated compounds exhibited antioxidant activity comparable to that of ascorbic acid (Mikhaeil *et al*., 2004).

The antibacterial properties of *Lawsonia inermis* commonly known as "Henna or Mehandi" tested against bacterial pathogens (*S. aureus*, *P. aeruginosa* and *E. coli*). Agar diffusion susceptibility test revealed inhibition zone of henna sample. The henna leaves exhibited the best result followed by fruits, bark root and stems. The used solvents were ethanol, methanol, ethyl acetate and hot water. The ethanolic extract and ethyl acetate extract showed the best result against one gram positive culture, *Staphylococcus aureus* (MTCC 2940) and two gram negative cultures *Pseudomonas aeruginosa* (MTCC 2453) and *E. coli* (MTCC 739). The MIC value was determined by using broth dilution methods. Ethanolic extract of henna was used for the determination of MIC against test organisms and it was found to be 1.45 mg mL^{-1} for *E. coli* and *Pseudomonas aeruginosa* (Pandey and Kumar, 2011).

Henna extracts were investigated for their antibacterial activity at different concentration against a wide array of different microorganisms including a laboratory standard strain of *Pseudomonas aeruginosa*

and eleven fresh clinical isolates of *P. aeruginosa* obtained from patients attending the Sultan Qaboos University Hospital (SQUH). 2-Hydroxy-p-Nathoqinone-Tech (2-HPNT, MW = 174.16 $C_{10}H_6O_3$) was included as control (at 50% concentration) along with the henna samples tested. Henna samples demonstrated antibacterial activity against all isolates but the highest susceptibility was against *P. aeruginosa* by henna samples obtained from Al-Sharqyia region. Omani henna from Al-sharqyia region demonstrates high in vitro anti-*P. aeruginosa* activity compared with the other henna samples from different regions of Oman (Habbal *et al*. 2011).

ANTI-CANCER ACTIVITY

Some researches were carried out in Turkey to determine the anti-cancer efficacy of *Lawsonia inermis* leaves in Ehrlich ascites tumour bearing Swiss albino mice. Administration of 10 mg kg^{-1} b. wt. of *Lawsonia inermis* to tumour bearing-mice increased the percentage mean standard life and mean survival period of tumour bearing mice. *Lawsonia inermis* also caused significant ($p<0.05$) reduction in the total number of tumour cells, the reduced glutathione levels when compared with the control mice given only tap water.

Administration of *Lawsonia inermis* extracts however caused an increase in the pH levels. The study indicates a possible inhibition of cancer cell metabolism by the *L. inermis* extract (Zumrutdal *et al*., 2008; Ozaslan *et al*., 2009).

In the earlier works about the effect of *L. inermis* in solid Ehrlich tumour-bearing mice was investigated by Zumrutdal *et al*. (2008) The diameters of the gluteal solid tumor mass were higher on the 12th day in animals given water when compared with the mice receiving *L. inermis* extract. Administration of the extract also caused increase in the pH and reduced glutathione levels of mice when compared with mice receiving water only. Orally administered extract also caused a reduced lipid peroxidation in mice (Zumrutdal *et al*., 2008).

A similar work by Priya *et al*. (2011) revealed that *L. inermis* extracts can prevent the tumor cells multiplication in the DLA induced mice and increased the mean survival time and life span of mice. The study shows that the plant can be exploited as a source of novel drug development for cancer treatment.

Henna has a common traditional usage throughout the world. Due to its palliative, curative and healing effects, it is a famous medicinal plant in most cultures.

Recently, the studies about biological activities of henna have an increasing trend. We also worked out on anticancer and antimicrobial effect of henna here in Turkey.

On the other hand; further investigations are needed about henna's clinical usage. It is obvious that cancer is the one of the most common reason of human death the medicines are looking for a tool to use in such cure. Under these circumstances, we suggest that phase II, III and IV studies of henna should carry out as soon as possible. This will prove the miracle effect of henna in health care and cure.

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