

Licorice or Liquorice (*Glycyrrhiza glabra*)

a. Name and description:

The English name of the plant is Licorice while Botanic name is *Glycyrrhiza glabra*(Gg) .Glycyrrhiza means sweet root in latin (Oxford, 1993), and glabra means smooth fruit of plant (Tyler *et al.*, 1988).The plant belongs to Leguminaseae family (Trease and Evans, 2002), this genus glycyrrhiza contains 14 kinds (Grieve, 1995).The Glycyrrhiza consists of dried unpleed roots and stolons of *Glycyrrhiza glabra*.



a

b

Picture: Licorice

a) plant of Licorice. b) The root of plant and its cross section.

Alsaraf (2005)

b. Licorice composition:

The Licorice contains phytochemical compounds that have biological and physiological effects on most mammals. These components can be classified to:

a) Flavonoids and Isoflavonoids:

include phenolic compound e.g. Liquiritin, Isoliquiritin (acholacone), Liquiritigenin, Isoliquiritigenin (cholacone form) (PDR,1998; Trease and Evans,2002).It is also contains formononetin, glabrin, glabral, glycerol, glubridin, glysarine, 3-hydroxyglabrol, glycyrrhisoflavonic (Hoffmann,1996 ;Asada *et al*,1998; PDR,1998; Treas and Evans,2002).

b) Terpenoids and Saponins:

They are oily compound that consist of attached five hydrocarbonic units that called isoprene which include:

β -amyrin, glycyrrhizin, glycyrrhetol, galabrolide, licoric acid, liquiritic acid (Hayashi *et al*,1992;Newall *et al*,1996)

c) Vitamins:

The *Glycyrrhiza glabra* consist of different types of vitamins such as B1,B2,B3,B6,C,E, Biotin, Folic acid, Pantothenic acid(Ode, 1993; Murray,1995; Blach and phyllis,1997; Beresford,1999).

d) Volatile oils:-

There are more than 80 components in Licorice e.g.: Benzaldehyde, Fenchone, Linalool (Hoffmann, 1996), Anethole, Estragole .Eugenol, Hexanoic acid (PDR,1998).

e) Minerals:

The *Glycyrrhiza glabra* contains many mineral compounds mainly: Aluminium, Calcium, Iron, Magnesium, Cobalt, Zinc, Phosphorus, Sodium, Silicon, Potassium, Stannous (Grieve, 1995).

f) Coumarins:

They are phenolic compound found in the *Glycyrrhiza glabra* e.g: glycyrrin, umbelliferone, ligcoumarin, herniarin (Tawata *et al.*, 1990).

g) Other compounds:

The *Glycyrrhiza glabra* contains also protein and amino acid e.g. Asparagin. Polysaccharide e.g.: Glucose, Fructose, Sucrose, Maltose, Lignins, Yellow dye (Langer, 1998; Trease and Evans, 2002).

c. Effect of some compounds of licorice on body

I) Glycyrrhizin

It is the cause of sweet taste of licorice and it's 50 times as sweet as sugar. Aglycon {Glycyrrhetic acid (GA)} plus two molecules of glucouronic acid are result from hydrolysis of Glycyrrhizin (GL) (Tyler *et al.*, 1988).

Glycyrrhizin metabolize when taken orally to GA then to 18- β Glycyrrhetic acid which in turn is converted to 3- α hydroxy Gglycyrrhetic acid by the effect of micro flora's enzyme in human's small intestine (Akao, 2000a). While in rat this conversion occurs by effect of Glycyrrhinate dehydrogenase enzyme that present only in the liver of male adult rat. Androgen hormone play an important role in regulation of this enzyme (Akao, 2000b).

Both GL and GA have been reported to bind glucocorticoid and mineralcorticoid receptors with moderate affinity, Moreover, GL and GA can bound to estrogen receptors, sex hormone binding globulin and corticosteroid binding globulin with very weak affinity (Newall *et al.*, 1996; Armanini *et al.*

.,1999). GA and GL inhibit 11- β -hydroxy steroid dehydrogenase in liver and kidney which metabolizes active cortizole to inactive cortizol (Stewart *et al* .,1987),these cause accumulation of active cortizole in kidney and linked with Aldosteron's receptors and stimulate it ,which lead to sodium retention, with excretion of potassium, increase extracellular fluid leading to hypertension, hyperkalemia, metabolic alkalosis (Clore *et al* .,1992;Lee uw *et al*.,1993).

Langer (1998) observed adaptogenic properties of glycyrrhizin in body, which GA stimulate cortizole's product when body needed. Also it can metabolize the cortizole when its product more than body need.

The anti estrogenic action documented for glycyrrhizin at relatively high concentration and has been associated with a blocking effect that would be caused by glycyrrhizin binding at estrogen receptors (Pizzorno and Murray, 1985).

II) Flavonoids

There have more 5000 kinds of flavonoids in Gg , (Strack, 1997).The flavonoids are important factors in human healthy by decreasing the risk of disease and increase the activity of vitamin C, inhibition platelet aggregation, and its action as anti inflammatory, anticancer, antioxidant substance (Cook and Samman, 1996;Craig,1999).

Licorice contain large groups of flavonoids component which show high effect of antioxidant like Glabridin,4-O-methylglobiolin,Formonoetin,Isoliquiritigenin,and Hispaglabridin (Haraguchi *et al* .,1998).These substance considered as powerful antioxidant by protect low density protein and RBC from different oxidative stresses via remove of free radical and inhibition of lipid oxidation of cell membrane (Fuhrman *et al* .,1997; Vaya *et al* .,1997 ;Haraguchi *et al* .,1998).

d. The effect of *Glycyrrhiza glabra* on some fertility aspects:

There were different studies that showed effect of licorice on mammalian breeding. Kumagai, *et al.* (1967) stated that high concentration of glycyrrhizin lead to inhibit action of estrogen in body .Corrocher (1983) observed that *Glycyrrhiza glabra* caused amenorrhea in women when high amount were taken for long period of time .The *Glycyrrhiza glabra* may be used for the treatment of infertility in Japanese women complaining from hyperandrogen as one of the main substance that inter in the drug called Shakayaku-Kenzo-To (Yaginuma *et al.*, 1982).

Mahdi (2000) found that treatment of lamb with 200mg/kg b.w./weekly lead to increase of certain sperm characters such as mass motility (95%) and the individual motility found to be 93% compared with control group (82%, 77 % respectively) which may prove that treatment with *Glycyrrhiza glabra* extract may be result in increase of testosterone level that elevate certain sperm characters .Other studies observed effects of licorice on some fertility aspect of Awasi ewes (Aal-saeid, 2003).

e. Medical use of Licorice

Recent literature describe licorice as expectorant, laxative, and anti inflammatory and use to treat peptic ulcer, Addison's disease, and to remove bitter taste of some drug and increase absorption rate (Tyler *et al* .,1988).Also, licorice is used to treat chronic gastritis, bronchial catarrh, bronchitis and cold disease (Newall *et al* .,1996).

Glycyrrhizin can act as a useful vehicle for variable drugs used topically not only as anti inflammatory and antiviral effect relevant but also glycyrrhizin enhances skin penetration by the drug (Evans, 1999).This plant can be used to treat rheumatoid arthritis and also as appetizer and antispasmodic (Grieve, 1995).

Langer (1998) believed that licorice can be used for the treatment of asthma, chronic fatigue, depression due to hormonal imbalance and hypoglycemia, also *Glycyrrhiza glabra* has some effect against virus like (HIV) and anticancer activity.