

Liquorice (*Glycyrrhiza glabra*): the journey of the sweet root from Mesopotamia to England

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Abstract

Liquorice is a very ancient plant widely used in the East for millennia. It has often been employed in sweets and confectionery and also for minor ailments including cough, constipation and dyspepsia. It was probably carried to Europe by the Cluniac order of monks. Then, almost by accident, it became established in West Yorkshire at Pontefract after the dissolution of the monasteries in the 1530s. Abuse of liquorice is not uncommon. It can occur

in the anorexia/bulimia syndrome and also in the dangerous condition of pseudoaldosteronism, which is characterised by severe hypertension and hypokalaemia and can lead to death. Liquorice remains a useful sweetener for all sorts of confectionery, including sweets and cakes (together with beer and liqueurs).

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The liquorice plant (*Glycyrrhiza glabra*, the Sweet Root): its form and distribution

The *Glycyrrhiza* genus (a member of the *Leguminosae* family) comprises a group of some 20 species of sticky perennial herbs with trifoliate (or pinnate) leaves, pea-like flowers and a deep root system.¹ The species are scattered widely throughout Eurasia, Australia, North and South America and China. *Glycyrrhiza glabra* is the usual source of commercial liquorice. It has a more restricted distribution, principally around the Mediterranean littoral and in central Asia. It grows wild (and in profusion) between the latitudes of 30 and 45 degrees North. These pass through Spain, Italy, Greece, Caucasian Russia, Syria, Iraq, Iran and China. The most valuable commercial species (and the most widespread) is *Glycyrrhiza glabra*.² The plant grows to a height of 3–4 feet (90–120 cm). It prefers sandy soil with free drainage. Only after 3 years of growth are the roots thick enough to be harvested. It tolerates flooding very well and therefore is profuse on the banks of the Tigris, Euphrates, Po and Ebro (up to 100 yards on both sides of each river).

The ancient history of liquorice (circa 3000 BC until the Greek civilisation)

Liquorice has a long and distinguished history. References to the plant are found in the early written works of China, India, Babylon and Assyria.³ A major figure here is the great Greek historian Herodotus. It seems that he was exiled from Athens for a period of time and found himself in the Black Sea area on the borders of the Scythian Empire. He was extremely impressed by the Scythians and their military ability, horsemanship and efficiency as units of cavalry

(Figure 1). They could also endure long periods of thirst by eating liquorice root and drinking mare's milk.⁴ Herodotus suggested that liquorice root should be used in Greek culture and this idea was taken up first by Theophrastus in the 3rd century BC when in his treatise, *An enquiry into plants*, he advocated the use of the sweet root in asthma and other respiratory diseases. He also suggested its use combined with honey for the treatment of wounds and ulcers. In the 1st century AD Dioscorides wrote the first comprehensive treatise on *Materia Medica* and this became the standard work for over a thousand years. It contained descriptions of about 700 plants and 300 other remedies (such as those from mineral rocks and animals parts). His section on liquorice included its use in chest and stomach complaints, mouth ulcers, pruritus ani and haemorrhoids. This treatise was widely translated, in particular into Latin and Arabic.

When the Greek civilisation was overrun by the Romans, a great number of books were lost. Fortunately this treatise on *Materia Medica* (in an Arabic translation) persisted in the library of the House of Wisdom, a great collection of scientific and medical knowledge in Baghdad.⁵ In particular the famous physician Ibn Baithar used the book extensively in the 13th century in his writings on therapeutics. This knowledge was spread widely through the Islamic caliphate, as far west as Spain and as far north to the area now known as the Balkans.

Liquorice moves to England: the role of the Cluniac monks

From 1095 to 1272 there were eight separate military Crusades to attempt to regain the Holy City of Jerusalem

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from the Saracens (a Muslim Arabic group). They met with a varying degree of success. At one time the Crusaders held Jerusalem, but they were expelled from the city for the final time in 1244. These expeditions were usually accompanied by groups of monks. One particularly active group were the Cluniac monks (who were an offshoot of the Benedictines). Their mother house was at Macon in northern France. By the end of the 12th century there were about 300 of their abbeys in Europe and, of these, 30 were in England, notably at Bermondsey, Reading, Faversham and Pontefract.

The Cluniac monks are thought to have 'discovered' liquorice when accompanying the Crusaders in the Middle East, where it was already a popular drink and a suitable alternative to the banned substance, alcohol. It is thought that they then grew liquorice in their herb garden at Pontefract. This source would encourage the widespread cultivation of the plant in this West Yorkshire area after the dissolution of the monasteries by Henry VIII in the 1530s.

The herbalists and liquorice

The period from 1400 to 1650 was the great age of the herbalists, including such famous exponents as Gerard and Culpeper. Both these men noted that liquorice was a most useful herb and had positive effects in mouth ulcers, dyspepsia and piles (see 'Dioscorides' above). The problem that would rapidly become clear was that different liquorice extracts had different potency and in some cases the extract had no effect at all ('red liquorice'). Standardisation was absolutely necessary and this would only become possible when the principal active compound, glycyrrhizin, was isolated. Liquorice would prove to be a very versatile substance and it would be used later as a sweetener in confectionery, to sweeten beer and a liqueur (Sambuca), to sweeten foul-tasting medicines and finally (and bizarrely) to fight fire and as a compost for the culture of mushrooms.⁶

The chemical structure of liquorice (glycyrrhizin) and its semisynthetic derivative carbenoxolone

The active principle of liquorice defied analysis until the emergence of the modern analytic tools of organic chemistry between 1850 and 1950. These included paper, column and gas chromatography, together with electrophoresis and finally mass spectroscopy. Crude liquorice extract was a Pandora's box containing variously terpenes, starch, gum, lignin and different sugars. This led to various dealers adulterating pure liquorice with added sucrose (cane sugar) in order to bulk up the product and defraud the purchaser. The chemical puzzle was solved by several groups simultaneously when the active substance glycyrrhizin was isolated in the mid-20th century. Its estimated sweetness is variously 20–50 times that of glucose (weight for weight). The structure of glycyrrhizin is also unusual in containing two glucuronide groups in the side chain (in contrast to the usual one).

Figure 1 Scythian gold belt buckle. Two cavalymen resting under a tree accompanied by their horses and a female deity



In the 1960s a new semisynthetic derivative, carbenoxolone, was synthesised.⁷ The two side chain glucuronide had been removed by hydrolysis and a new side chain, derived from succinic acid, added. Both glycyrrhetic acid (the compound remaining after removal of the glucuronide side chains) and carbenoxolone were shown in clinical trials to heal peptic ulcers in about 50–70% of patients (Figure 2). They seemed to produce the effect by increasing prostaglandin synthesis in the gastric mucosa, thereby stimulating mucus production that facilitated the healing of the ulcer. We now know that the vast majority of peptic ulcers are caused by an infection with the bacterium *Helicobacter pylori* and this organism can usually be eliminated with a triple antibiotic regime. Within a few years the treatment of peptic ulcer with either liquorice or carbenoxolone became obsolete.

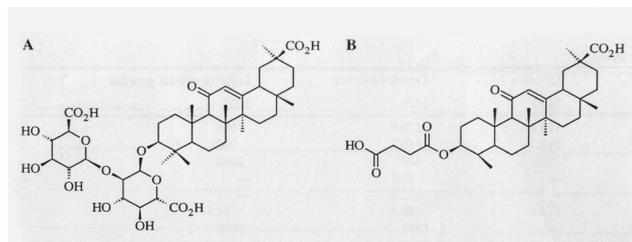
Problems with liquorice abuse

In the last 20 years liquorice has been considered to be a pleasant, largely innocent confectionery. It is also a useful over-the-counter demulcent in colds and coughs, and in dyspepsia and constipation. However, a number of problems have arisen in relation to overuse (or abuse) of liquorice. The two main areas of concern are the abuse of the herb as a laxative and the syndrome of pseudoaldosteronism.

Laxative abuse

The usual presentation is a young woman, aged 10–30 years, who develops anorexia/bulimia/laxative syndrome. The patient has an abnormal view of their body image (weight) and starts to slim by refusing meals or cutting down food intake severely, then turning perhaps to induced vomiting (bulimia). The patient then finds a more acceptable alternative intervention, that of taking an excess dose of a laxative. Many herbal preparations have been employed with this outcome in mind, the most common being senna, rhubarb and liquorice. The excessive loss of fluid from the colon helps to get the patient's weight down, but unfortunately, the loss of potassium in the kidney (in exchange for sodium) can result in chronic renal damage and even death.

Figure 2 Chemical structures of (a) glycyrrhizin and (b) carbenoxolone, two compounds effective in the treatment of peptic ulcer



The syndrome of pseudoaldosteronism (apparent mineralocorticoid excess)

Both chronic overconsumption of liquorice and carbenoxolone can produce a damaging clinical disorder. This comprises hypokalaemia, hypertension and oedema, often with muscle and brain damage, including rhabdomyolysis and stroke.⁹ Liquorice inhibits 21- β -hydroxylase. As a result of this inhibitory action plasma cortisol rises and plasma cortisone falls (Figure 3). Cortisol has about 20-times higher activity than that of cortisone on the mineralocorticoid receptors. Consequently, sodium is retained in the kidney, whereas potassium is lost, resulting in the syndrome described above. However, in contrast to primary aldosteronism (Conn's syndrome), the production of aldosterone falls. Hence the syndrome produced by liquorice is called false or 'pseudoaldosteronism' rather than 'true aldosteronism'. It is therefore particularly important when questioning a patient with so-called 'high blood pressure resistant to the normal hypotensive drug regimens' to ask directly about their intake of unusual food, and in particular liquorice. Particular culprits are, in our experience, Bassetts Liquorice Allsorts and Pontefract Cakes.⁹ It is also important to remember that the action of glycyrrhetic acid is prolonged. As a result, potassium salts may need to be taken to replenish body stores of the element for 2–3 weeks after liquorice is stopped. Spironolactone treatment and intravenous potassium may be necessary in very severe cases.

Figure 3 Effect of liquorice on cortisol and cortisone metabolism

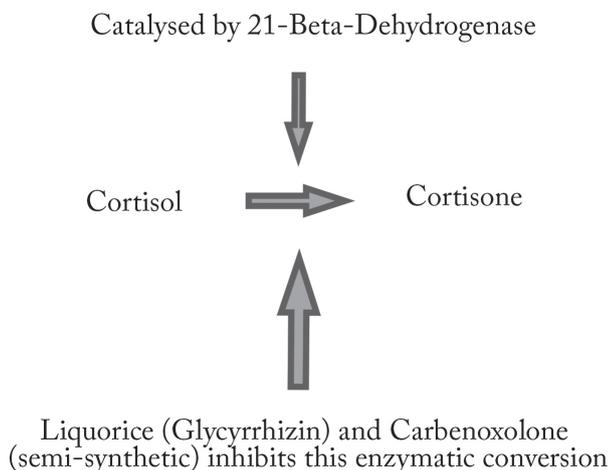


Figure 4 Pontefract Castle in West Yorkshire prior to its destruction at the end of the English Civil War



What are the safe levels of liquorice that can be eaten?

In view of the potentially serious clinical consequences of the ingestion of excessive amounts of liquorice, attempts have been made, particularly in Europe (and UK), to determine the safe upper limit for the ingestion of this herbal compound. The authorities of these countries have determined jointly (and severally) that a concentration of 50 parts of glycyrrhizin per million should be the upper limit in sweets, beer and liqueurs. Expressed in another way, no more than 100 mg of glycyrrhizin should be ingested per day.¹⁰

The history of liquorice cultivation and manufacture in Pontefract (Pomfret, West Yorkshire) from the 16th century to the present day

Henry VIII, at one time called by the Pope the Defender of the Faith (Defensor) was then later excommunicated after he had defied the Church law by divorcing Catherine of Aragon. Partially in revenge (and desperately wishing to raise money for the building of a great navy to defend his realm from possible invasion by the Catholic countries of France and Spain) he then dissolved the monasteries, sequestering and then selling off their assets. The monks, nuns and lay brothers were ejected and, indeed, in some cases executed, for resisting this process. In West Yorkshire

Figure 5 Wilkinson's Liquorice factory in Pontefract circa 1900. Their motto was 'A delicious sweetmeat for young and old'



Figure 6 Digging out liquorice roots in Pontefract circa 1910. Note how deep the trench has to be to expose the best roots



the local farmers (as happened in other areas) bought monastery lands and gardens and then continued to grow liquorice successfully. The secrets of the monks had at last become generally available. Liquorice-growing spread widely throughout the nation to places such as Spalding, Worksop, Ely and New Cross (London). These other areas gradually discontinued production and, by 1850, Pontefract became the sole remaining area in England where liquorice was in cultivation.

The next major event in the history of liquorice resulted from the English Civil War. Pontefract Castle had been besieged by the Parliamentary army for 3 years (Figure 4). After the turmoil was over, the townsfolk were so exasperated by the experience that they requested that the castle be demolished.¹¹ The Town Council then rented out the areas within the remaining castle walls for the cultivation of liquorice (the so called garths). From this point liquorice production in the Pontefract area expanded rapidly. Several

Figure 7 Pontefract Cakes tin, manufactured by Wilkinson's

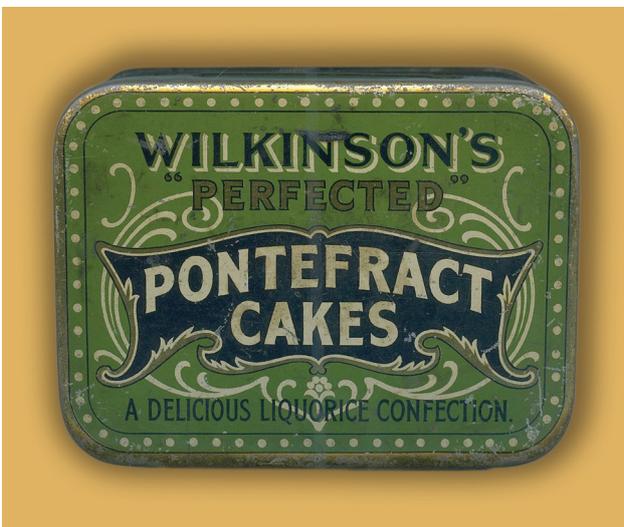


Figure 8 Liquorice pans at Ewbanks destroyed by bombing by the Luftwaffe in 1941



eminent herbalists including Gerard and Culpeper visited the town and were much impressed by the extent of the liquorice fields. By the year 1750, a local directory noted that there were about 50 different growers, each paying a tithe of one shilling in the pound to their local church. The secrets of cultivation of the herb were closely guarded. Any person selling liquorice sets (shoots) or buds (seed) outside the town boundaries would be fined half a crown, a considerable sum in those days, and banned from liquorice growing *sine die*.

The modern era

In the 1820s two major developments took place. A local Pontefract chemist called George Dunhill found that if he added sucrose from cane sugar to a liquorice mix, he could produce a 'sweet'. The second and perhaps even more important development was the introduction of steam power to enable 'punching' and 'stamping' machines to be developed. This allowed the mass production of squares and roundels, the basis of the Allsorts and Pontefract Cakes of today. From this period onwards development was explosive. Factories sprang up all over the area (Figure 5). Initially the liquorice produced in the local fields in and around Pontefract was sufficient to supply the burgeoning local industry (Figure 6), but after several disappointing summer seasons, the local supply proved to be inadequate. Therefore, in the 1920s the manufacturers turned over to other sources of the root, including Spain, Italy, Greece and Turkey. From 1900 to the outbreak of the Second World War weekly liquorice production increased from about 40 tons to approximately 400 tons.¹² The numbers of workers also increased dramatically in parallel with this huge output. At maximum production there were more than 7,000 women and about 2,000 men in the factories of 'Liquorice Town', producing everything from sweets, Pontefract cakes, Catherine wheels and Spanish sticks to many other concoctions, including flavoured tea (Figure 7). A major export was to the USA for mixture with tobacco in chewing preparations in order to disguise the bitter taste of the plant leaf caused by the alkaloid nicotine.

The devastation of the liquorice industry in the Second World War

The liquorice machines came to a shuddering halt with the declaration of hostilities between Britain and Germany. Two governmental decrees were promulgated that seriously damaged the production of the sweets. First, all licences to import raw liquorice from the Mediterranean states were abrogated. This severely restricted the supply. Secondly, sweet rationing was introduced in 1939 and lasted until long after the war was over (1953). A number of factories closed (and never reopened), a number turned over to the manufacture of military material for tanks, airplanes and parachute silk. One major factory, Ewbanks, was destroyed by the Luftwaffe (Figure 8). The post-war industry became but a pale shadow of its former glory.

Reflection

The widespread knowledge and use of liquorice in human history is reflected by diverse reports of it being found in

disparate civilisations and cultures, including Arabic, Indian and Chinese. Following the Crusades it was brought back both by knights and religious orders. Almost by accident, an industry was founded in Pontefract, West Yorkshire, and this has flourished for the last 500 years. Liquorice was used at one time for ‘allsorts’ of ailments and was present in most of the herbals (and the pharmacopoeias which followed them). It is no longer a prescribed medicine, but its place in ancient folklore should still be widely recognised and suitably honoured. ①

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