

## Review

# Pot marigold (*Calendula officinalis*) medicinal usage and cultivation

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***Calendula* pot marigold, is a genus of about 12 to 20 species of annual or perennial herbaceous plants in the daisy family Asteraceae, native to the area from Macaronesia East through the Mediterranean region to Iran. *Calendula* should not be confused with other plants that are also known as marigolds, such as corn marigold, desert marigold, or marsh marigold or plants of the genus *Tagetes*. The name *Calendula* stems from the Latin word *kalendae*, means first day of the month, presumably because pot marigolds are in bloom at the start of most months of the year. The common name marigold probably refers to the Virgin Mary, or its Old Saxon name 'ymbglidegold', which means 'it turns with the sun'. The most commonly cultivated and used member of the genus is the pot marigold (*Calendula officinalis*). The flowers of *C. officinalis* contain flavonol glycosides, triterpene oligoglycosides, oleanane-type triterpene glycosides, saponins, and a sesquiterpene glucoside. Plant pharmacological study have suggested that *Calendula* extracts have anti-viral, anti-genotoxic and anti-inflammatory properties. *Calendula* in suspension or in tincture is used topically to treat acne, reducing inflammation, controlling bleeding and soothing irritated tissue. There is "limited evidence" that calendula cream or ointment is effective in treating radiation dermatitis. In a randomized study of 254 radiation patients, topical application of 4% calendula ointment resulted in far fewer occurrences of Grade 2 or higher dermatitis than occurred in the group using trolamine. *Calendula* has been used traditionally for abdominal cramps and constipation.**

**Key words:** *Calendula officinalis*, saponins, ornamental plant, candolin.

## INTRODUCTION

From hundreds of centuries ago, in ancient times, and from times when the human being was active as today on the scene of life and fighting for life, along with his struggles to provide food and clothing, he was thinking about his health, finding ways to live healthy and relieving physical ailments and illness which was later called the medicine, for sure has been among the first sparks of the human beings mind, and struggles to live healthy and the medicine have implications as long as the history of the creation, and as wide as thousands of research, exploration and experience (heydar, 2003).

In the Achaemenid Persia, herbal medicine had a

signification development and in addition to the experiences that existed in the country, people made use of these findings and that of the Greek. During the Sassanid era, traditional medicine expanded widely and the famous medical school, Jojndi-Shapour, was founded after demise of seasoned dynasty, and during the Abbasid caliphate to Baghdad and a movement to translate Greek medicinal books into Arabic began.

Unfortunately, the advent of modern medicine in the west and its spread to other parts of the world affected the science and skill of using traditional medicine and herbal drugs, thus causing them to be removed completely from the medicine education programs. However, the return of human beings to this mode of treatment has yielded results; today more than 80% of experiments in research centers of the world are based on the use of herbal and natural substances.

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At the moment, in the U.S. and western countries, a huge movement has begun to use natural and herbal drugs (Falahatgar, 2003).

A plant, like chemical drugs, has specific chemical effects, so that its use, like other herbal drugs, has a certain dose; therefore, if taken inappropriately and without an expert's permission it will be dangerous as any chemical drug and have harmful effect (Falahatgar, 2003).

In the modern age of pharmaceuticals, doctors and research teams of many countries have once again turned their attention to natural sources and herbal drugs in a way that currently we witness the rapid founding of big productive and experimental farms. Today, growing of medicinal plants is a significant branch of auricular with the aim of extracting and providing raw materials to make drugs (Zaman, 2003). At the moment, a large number of the drugs used have herbal origins and this rate is definitely growing up. This study is aimed to review the history of pot marigold growth, and its medicinal uses including allergic and side effects, along with pharmacology.

## HISTORY OF THE POT MARIGOLD GROWTH

Pot marigold was grown as an ornamental plant for long times until its medicinal effects were discovered and thus, it began to be used as a medicinal plant. In Europe, the growth of this plant began in 17th century. Its flowers that have no calyxes and have been introduced as drugs in some pharmacopoeia and are used to cure stomach and intestine diseases (Stary, 1991).

This plant has been grown in European gardens from 12th century on. It is bitter, small has always been used as an efficient pesticide, and the plant is used among other plants to kill insects (Martin, 2005). On the other hand, The pot marigold plant grown by Egyptians, Arabs, Indians, and Greeks and in the Europe's garden has been grown for medicinal purposes from 12th century on (Zaman, 2003).

The name of this plant comes from calendus which means 'the first day of each month' because it takes a long time to flower. Moreover, since the flowers of this plant follow the sun, it is regarded as a sign of the sun (Kathi and Kemper, 1999). This plant is grown as a medical drug in Germany, Australia, Czech, Austria, Switzer land, Hungary and recently in Egypt and Syria as well (Amodbeygi, 2005). It is also grown in the Mediterranean countries such as the Balkan states, the east of Europe, north of America and also in Germany (Samsam, 2003).

Pot marigold is indigenous to central, eastern and southern parts of Europe. The pot marigold plant has been grown in European gardens from 12th century and is used in the popular culture dates back to those times. It is believed that pot marigold plant originated from Egypt,

but it is widely distributed in the world now; which is an unsaturated fatty acid. It is chemically similar to the conjugated linoleic acids; Laboratory studies suggest that, it may have similar health benefits. In addition, it can be used in painting, making covers, and cosmetics (Martin and Deo, 1999).

The pot marigold has been grown as an ornamental garden plant for years and it has many uses. Essential fat and pigments that are extracted from this plant after being processed are sold as ingredients of medicinal products. The chemical structure of the calendic acid in the seed's fat has also made it suitable for use in industrial products (Marwin, 1999).

## Medical use

The pot marigold is used as sudorific, blood refiner, blood sugar reducer and also use as anti-inflammatory skin (Khavarinejad and Lucia, 2004). The tincture and sap of its flowers are used locally to hasten the cure of injuries and to reduce swellings. Its sap is also used to reduce the body temperature, cure painful menstruation and cancer. The pot marigold flower has astringent, menstruation, anticonvulsant, energizing, antiseptic, nourishing, sopoforic, diuretic, blood thinners elimination of vomiting effects. In anemia, kidney problems, grip, mumps, chicken pox, measles, ulcer, jaundice, neurotic problems, eliminates acne pimples, skin disease, wounds, snow bites, it has incredible effects. In external uses as tincture, one spoon in one cup of water is rubbed on the wounds and it avoids the swelling or infection of these. In compressed form, it is used for varicose veins and when 30 grams of Pot marigold flower is boiled in water, it can be used as to lower the cholesterol level of the blood or blood pressure because of dilation of surface vessels, relieving stomach ulcer and curing digestive system problems.

Currently, this plant is used in registered homeopathic drugs. Its more and orange kinds are favorable medicinally, since they contain a lot of effective components. To improve the appearance of other medicinal substances, they use the Pot marigold flower's dark orange color (Zaman, 2003).

Additionally, Pot marigold has been found among the most effective drugs to cure extreme bleedings of hemorrhoid. It is suitable to stop gum bleeding. It has constricting effects and is also used to vessels constrict and to stop bleeding immediately. The fresh milk of its leaf in one or two spoons is good to cure regurgitation and internal lacerations. Eating its soup is a common practice so that American calls it "pot herb". In France they commonly use it brewed to lower body temperature and perspiration as an effective tranquilizer (Mir heydar, 2003).

The colorful flowers of the pot marigold make one feel fresh and healthy. Some of its combinations such as

resins have antifungal, anti-bacteria, and antivirus effects. Moreover, this plant is used to cure the blisters of toddlers' feet and relieve burnings in nipples caused by breastfeeding (Zarezadeh, 2003).

One product of pot marigold's sap with a density of 5% along with Adantoin is effective widely in stimulating the skin during surgeries. Researchers have discovered that the ointment of pot marigold enhances metabolism of the production of glycoprotein, nucleoprotein, and collagen in that location. The nutritional use of the sap of ever spring's flower has anti-bacteria, anti-virus, anti-spasm, anti gastritis, intestinal antispasmodic and stomach, and stimulating body's immunity system effects. The blue sap of pot marigold has a favorable effect on *Staphylococcus vaginus*, and strengthens womb (vagina). Experiments done on the uses of the sap of pot marigold laboratory animals have illustrated a decrease in cholesterol, anti-tumor effects and anti Cytotoxic. In traditional medicine, it is used as anti-spasm, anti-worm and diuretic (Salehi-Sormaghi, 2006).

Along with horsetails (*Equisetum arvense* descriptor), pot marigold is one of the few plants which is considered astringent despite not being high in tannins (Elias, 1990).

### Allergic and side-effects

Calendula cream and products of pot marigold has shown no allergic and side-effects, although in some researches it has been proved that taking big doses of calendula acts as a tranquilizer. Thirteen kinds of saponin have been extracted from pot marigold. Few side-effects have been reported in pot marigold. Some people may feel itchy on their skin and they must be examined to make sure they have no allergies. Currently, there are no known interaction between pot marigold and other drugs (Edward and Gilman, 1999).

All herbal products are prone to be contaminated when combined with herbicides, pesticides, heavy metals, and herbal drugs. Also, allergic reactions to any natural products can be observed in sensitive individual. Allergic reactions to the pot marigold are possible but rare. Such reactions are possible for all members of the Succory family (Edward and Gilman, 1999).

The experiments on animals have shown an increase in the sleep time of those who have been given pot marigold and tranquilizer; thus some botanists have warned against the internal use of pot marigold by those patients who are using tranquilizers. No research has been done to examine such reactions in human beings (Zaman, 2003).

### Other uses

Colored substances extracted from the Pot marigold flowers are used in coloring food products and also in coloring some kinds of fat (Omidbeygi, 2005).

The essence of Pot marigold is used in perfume-making and its yellow color carotinoids is used in cosmetics as a coloring element (Salehi-Sormaghi, 2006). In cosmetics, the flowers of this plant are used for washing hair and removing highlight, and in herbal bath, it is used to soften the skin. It is also used if compressed to cure skin spots. Along with *Matricaria chamomilla* descriptor, it is used to soften and relieve all kinds of skins. It is also used for taking a bath or relieving the face and is good for face lotion (Blumenthal et al., 1998). Many products come out of Pot marigolds oil and are used in painting. Pot marigold florets are considered edible. They are often used to add color to salads, or added to dishes as a garnish and in lieu of saffron. The leaves are edible but are often not palatable. They have a history of use as a potherb and in salads. Flowers were used in ancient Greek, Roman, Middle Eastern and Indian cultures as a medicinal herb as well as a dye for fabrics, foods and cosmetics. Many of these uses persist today (Yoshikawa et al., 2001).

### Growing method and cultivation

The growth and spread of pot marigold is by seeds. The plants are grown in rows and at appropriate times in the main field. In order to speed and coordinate the growth of seeds, the field must be watered after they are planted (Omidbeygi, 2005).

With all its variety and abundance in some areas, this plant is always grown at an ornamental one. Proliferation of the pot marigold in permeable fields and almost wet which have enough fertilizer especially nitrogen and phosphorous is done with fruit seeds. To reproduce the plant, the seeds are planted in a greenhouse that has the appropriate temperature first. Then the resulted young plant is transplanted along lines with a distance of 80 cm between them so that every plant is located at least 40 to 45 cm from the other. By using the greenhouse method, before March until the early April, we can move the resulted young plant to the main field. Therefore, in this way the harvest time become sooner by one month. In fact, the plant's capituls are sent to the market earlier than expected. Without using the greenhouse method it is also possible to reproduce the plant. So that the seeds are planted in furrows 3 cm deep and attention is paid that in every 40 cm distance, two to three seeds are planted. The seeds must be covered with a specific thin layer of soil because they are near air which is often cold and inappropriate. By using this method, after the seeds are turned into young plants, their distances are made appropriate and additional bushes are taken out or replaced to other places which have been prepared beforehand. After harvesting their product, they are desiccated naturally in shades, or in special rooms where warm air is circulating or in desiccators with 35 to 40°C and after that, they are parcels in 20 to 30 kg Hemp and sent to the market (Samsamshariat, 2004).

It is native to central Europe and the Mediterranean area. This plant grows easily in sunny spots of Northern America and Europe (Edward and Gilman, 1999). The pot marigold flower is indigenous to southern Europe and also grows in other parts of the world. In western Iran, and also in the road between Qazvin and Rasht it can be observed as a wild plant (heydar, 2003).

The native land of this plant is the Mediterranean zone, the Middle East and central Europe and from there it had spread to other parts of the world. Its distribution is such that nowadays this plant grows abundantly in Morocco and other parts of Asia. In Iran, it grows especially in western parts of the country (Samsamshariat, 2003).

Its wild type is seen in deserted farms, meadows, pools and areas besides roads (Samsamshariat, 2003). The Pot marigold (Figure 1) grows in western and south-western areas of Iran and is also grown in other areas (Rejhan, 2002).

*C. officinalis* is considered by many gardening experts as one of the most versatile flowers to grow in a garden, especially since they are easy to grow from seeds (Figure 2) and tolerate most soil conditions. In temperate climates, sow seed in spring for blooms that last throughout the summer and well into the fall. In areas of little winter freezing (USDA zones 8-11), sow seeds in autumn for winter color, plants will wither in subtropical summer. Seeds will germinate freely in sunny or half-sunny locations, but plants do best if planted in sunny locations with rich, well-drained soil. Pot marigolds typically bloom quickly from seed (in under two months) in bright yellows, gold, and oranges (Zaman, 2003). Leaves are spirally arranged, 5 to 18 cm long, simple, and slightly hairy. The flower heads range from pastel yellow to deep orange, and are 3 to 7 cm across, with both ray florets and disc florets. Most cultivars have a spicy aroma. It is recommended to deadhead (removal of dying flower heads) the plants regularly to maintain even blossom production (Zaman, 2003). Numerous cultivars have been selected for variation in the flowers, from pale yellow to orange-red, and with 'double' flower heads with ray florets replacing some or all of the disc florets. Examples include 'Alpha' (deep orange), 'Jane Harmony', 'Sun Glow' (bright yellow), 'Lemon' (pale yellow), 'Orange Prince' (orange), 'Indian Prince' (dark orange-red), 'Pink Surprise' (double, with inner florets darker than outer florets) and 'Chrysantha' (yellow, double). 'Variegata' is a cultivar with yellow variegated leaves (Zaman, 2003). Calendula are used as food plants by the larvae of some Lepidoptera species including *Cabbage Moth*, The Gothic, Large yellow underwing (*Noctua pronuba* descriptor) and Setaceous Hebrew Character, *Xestia c-nigrum* L. (Zaman, 2003).

## CLASSIFICATION AND BOTANICAL CHARACTERISTICS

The pot marigold plant is from Asteracea family and its

scientific name is *C. officinalis*. It is a shrubby plant and its other names are: always-spring-garden, always-with-fruit, fire-like (Samsamshariat, 2004). In Persian they call it "Ever spring", in Indian they call it "gold flower", and in England it is called Pot Marigold (Mir heydar, 2003).

A one-year-old plant with a stalk consists of many branches which are covered by soft fuzz. Its height can reach 45 to 75 cm. Its leaves are simple curved, oval and covered with fuzz on both sides. Additionally, the leaves are long, thin, almost fuzzy and not jagged, and are located randomly on the branch. Their color is pale green (Omidbeygi, 2005).

Its capitols are large with a diameter of 3 to 5 cm. The flowers at the center of capitols are cylindrical with rows of yellowish-orange flowers surrounding them (Falahatgar, 2002). Small flowers are located on axis with concentric circles which amount to 4 to 8 in number. The flowers are orange or yellow. Aachen fruit is brown with a rough surface. Each grain weighs 8 to 12 g (Omidbeygi, 2005).

The root of this plant is conical and goes into the soil directly. From the lower part of the stalk many short branches come out (Omidbeygi, 2005). If enough space be provided, it can have a rapid growing speed. Stalks are angular and are covered with tiny hair. The bottom leaves of the plant are wide and wide and the top ones are smaller (Martin, 2005).

Flowers open mostly in the margins and close in the evenings (Salehi-Sormaghi, 2006). The flowers seem like a single shelf at the end of the flowering branch. It is spread by planting seeds in the spring (heydar, 2003).

## EFFECTIVE SUBSTANCES

The pot marigold flower contains a little fatty essence, saponin, resin, a bitter substance, organic acids, a substance called, calendolin, gum, over glaze materials, albumin, a dry substance in the petals, inulin (in root), palmitic acid, and cholesterol (Falahatgar, 2002). The flowers contain 2 to 4% of essence whose significant components are menton, izimenton, gama tripnin, alphamorolen. Combinations of pot marigold are glocozid acids, mosilag, tocoferol, carotinoides, terpenoids, polisacarids, tanens, calandoladiol, and tarags estrol (Salehi-Sormaghi, 2006).

Many of the medicinal products from this plant are produced by Anatolis metod of fresh flowers, and the components existing in pot marigold flower are flavonoids, like flavenol including izocorcitrin, narcicin, as its main ingredients and it also contains mentol, izomentol, tripnoids such as saponins, oleanolic acid, as a agliken and other ingredients such as free alcohols, glicocids, polisacarids and amblifron (Edward and Gilman, 1999).

The most effective ingredients of this plant are flavonoids solution in water (0/1 to 0/4% of a dry flowers weight). Other ingredients include catenoid (0/3% of a dry flower's weight) which dissolved in water and fat, essence (0/1 to 0/2% of a dry flower's weight) mosilage

substances, dissolved in water and vitamin E. Recent research has shown that the seeds of the pot marigold plant contain fat and if extracted under cold pressure will have anti-inflammation effects. The pot marigold flower contains resin, a bitter substance, organic acids, gum, over glaze substances, albumin, a colored substance (in dry petals), and inulin (in the root). The carotinoid ingredients of the pot marigold plant have not been studied for a long time. Carotinoids, a precursor in the production of vitamin A have a key role in the lives of animals and human beings. Although fat of Pot marigold is known as brewed or watered fat and herbal substances are boiled in fat to produce it and then the herbal ingredients are removed and the fat which contains some herbal components remains. The pot marigold ointment has many softening and healing effects which makes it a suitable candidate in making synthetic creams. This fat is useful to help soften swollen, itchy and rough skins and it is also good to cure exema and skin itching and varicose veins, if this fat be extracted in cold pressure it will have anti-swelling effects. Duke (1982) is one researcher's claims that pot marigold flowers also contain cholesterol, estrol, nalaric acid ester. In some countries like New Zealand there has been specific attention given to growing and using the seeds of pot marigold because these seeds contain 5 to 20% of fat (Cromack and Smith 1998).

## PHARMACOLOGY

*Calendula officinalis* is used for the treatment of skin disorders and pain, and as a bactericide, antiseptic and anti-inflammatory. The petals and pollen contain triterpenoid esters (an anti-inflammatory) and the carotenoids, flavoxanthin and auroxanthin (antioxidants, and the source of the yellow-orange coloration). The leaves and stems contain other carotenoids, mostly lutein (80%) and zeaxanthin (5%), and beta-carotene. Plant extracts are also widely used by cosmetics, presumably due to presence of compounds such as saponins, resins and essential oils (Zaman, 2003).

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