

Research on the Medicinal Plant Common Rue (*Ruta graveolens* L.) and Its Cultivation Technology

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Abstract Common rue (*Ruta graveolens* L.) is an evergreen perennial herbaceous plant with medicinal efficacy such as heat clearing, detoxification, and meridian activation. Its distinctive fragrance exhibits notable insecticidal effects. This paper discussed the biological morphological characteristics, cultivation techniques, medicinal value, chemical composition, and pharmacological actions of common rue.

Key words Common rue; Cultivation technique; Cutting seedling; Application value

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Common rue (*Ruta graveolens* L.) is the original plant of the traditional Chinese medicine "Choucao"^[1]. It is a perennial herbaceous plant belonging to *Ruta* of the Rutaceae family, also known as Choucao and Xiangcao, and serves as the national flower of Lithuania. Notably, common rue has been mistakenly identified as "Meizhou *Cassia*" or "*Cassia* seeds" in some contexts^[2]. The genus *Ruta* comprises approximately 10 species, distributed across the Canary Islands, Mediterranean coast, and southwestern Asia. China has introduced and cultivated two species of the genus *Ruta*, with one species being widely cultivated and the other found exclusively in the South China Botanical Garden^[3]. Currently, the cultivation technology for common rue are being studied in Moyu County, Hotan Prefecture, Xinjiang, where small-scale cultivation has been successfully implemented. In China's *Ministry of Health Drug Standards • Uyghur Medicine Volume*, it is documented as "the dried aerial parts of *R. graveolens* L. from the Rutaceae family". It is one of the commonly used medicinal materials in Uyghur medical practice, known as "SUZAB" in Uyghur.

Morphological Characteristics and Growing Environment of Common Rue

Morphological Characteristics

R. graveolens L. is a perennial herbaceous plant belonging to *Ruta* of the Rutaceae family. It is also known as Choucao and Xiangcao. The plant features a woody base, erect and branched stems, and emits a strong distinctive fragrance with a slightly bitter taste. It possesses a well-developed root system with numerous lateral roots, and the root bark is pale sulfur-yellow in color. The

plant typically reaches a height of 0.60–1.10 m. Its leaves are pinnately compound, measuring 6–12 cm in length, gray-green or bluish-green in color. In southern Xinjiang, China, the flowering period generally spans from mid-to-late May to mid-to-late November. The flowers are golden-yellow with four sepals and four petals, and a flower diameter of approximately 2 cm (Fig. 1–Fig. 2). The plant produces numerous seeds, which are triangular in shape, approximately 1.5 mm long, and brown-black in color. The fruit skin exhibits prominent oil glands. The fruiting period occurs from July to November. The chromosome numbers are recorded as $2n = 72$ and 81 ^[3].



Fig. 1 Botanical illustration of common rue (*R. graveolens* L.) (from Flora of China)

Growing environment

Common rue is an evergreen perennial plant that thrives in warm and humid climates, but exhibits strong cold and drought tolerance. The optimal growth temperature ranges from 12 to 28 °C. When temperatures drop to around –10 °C, the above-ground parts may be frozen to death, but the root system survives

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winter safely. The plant resumes rapid growth and flowering in spring, with blooms persisting until the onset of winter. In Moyu County, Hotan, the annual sunshine duration reaches 2 655 h, providing ample solar radiation. The region has an average annual temperature of 11.3 °C, a frost-free period of 177 d, and an annual precipitation of 37 mm, characterizing it as an arid desert climate. Despite this, the region benefits from sufficient land resources, moisture, light, and heat. Common rue does not have strict soil requirements and can be cultivated in well-drained soils.



Fig. 2 Common rue cultivated from cuttings in the experimental field

Cultivation Technology of Common Rue

The propagation of common rue medicinal materials includes two methods: seed propagation and cutting propagation. Seed propagation: Seeds are sown in spring or autumn, either by direct seeding or through seedling transplantation. Cutting Propagation: Cuttings are taken in spring and transplanted in the same year, or taken in autumn and transplanted in the following spring. Common rue does not have strict soil requirements, but cultivation in low-lying areas and saline-alkali lands should be avoided. Generally, well-drained sandy soil with good irrigation conditions and deep soil layers is suitable. The requirements in soil preparation are deep ploughing, removal of weeds and stones, application of base fertilizer and maintaining of loose soil.

Seed propagation of common rue medicinal materials

Common rue is propagated by seeds through two methods: direct seeding or seedling transplantation. Sowing is typically carried out in spring and autumn. The direct seeding method involves the steps of digging holes at a spacing of (45–50) cm × (30–35) cm, seeding, covering seeds with 2–3 cm of soil, lightly compacting the soil, and watering. The seedling transplantation method requires scattering seeds on the seedbed in autumn, covering them with a thin layer of soil just enough to bury the seeds, lightly compacting, watering, covering with straw, and transplanting in the following spring.

Cutting propagation of common rue medicinal materials

First, robust common rue plants that are 2–3 years old are selected to collect semi-lignified aerial branches as propagation material. The cuttings should be 6–10 cm in length. In spring, an appropriate timing is chosen for cutting based on local climate conditions, and transplantation and field establishment will be carried out in the same year.

Field management

For sown seedlings, appropriate sowing time is selected in spring according to local climate conditions, with soil moisture being maintained after sowing. After emergence, weeding and watering are carried out promptly, followed by appropriate thinning when the seedlings reach 10–12 cm in height to promote growth. For cuttings, suitable insertion timing is determined in spring based on local climatic conditions. Initial watering is performed after insertion to maintain soil humidity, followed by regular irrigation, timely weeding, and supplemental application of farmyard manure to support robust development of the cuttings.

Pest and disease control

Diseases and pests in common rue medicinal materials are generally not severe. At the seedling stage, root rot may occur, causing decay of the roots. As for insect pests, larvae of the *Papilio xuthus* can damage the leaves. Typically, lime is applied to diseased areas for disease control, while 90% trichlorfon is sprayed proportionally for pest management. No pest or disease damage has been observed in our experimental cultivation area. If root rot occurs in common rue, lime should be applied to the affected areas. For pests such as the larvae of *P. xuthus* damaging the leaves, a 800–1 000 times dilution of 90% trichlorfon should be sprayed^[4].

Medicinal Value and Pharmacological Effects

Common rue is an aromatic plant and also a traditional Chinese medicinal herb. Its branches and leaves contain aromatic oils, making them suitable as flavoring ingredients. The entire plant is used medicinally, characterized by a slightly bitter taste and cool properties. Due to the aromatic oils present in its branches and leaves, common rue serves as a spice and also exhibits insecticidal effects^[3,5].

Medicinal value

The seeds, branches, and leaves of common rue are all used as herbal medicine, so the entire plant are utilized for medicinal purposes. It has the effects of dispelling wind, relieving convulsions, promoting menstruation, killing pests, clearing heat, removing toxic materials, cooling blood, and dispersing blood stasis. Additionally, common rue can be used to treat conditions such as colds, fever, toothache, vomiting, abdominal pain, and diarrhea. It is also applied for injuries from falls, bruises, lower back and leg pain, and joint pain. Furthermore, it is used in treating acute bronchitis and bronchial mucosa inflammation in children^[5–6]. The seeds serve as anticonvulsants and anthelmintics.

Pharmacological effects of common rue medicinal materials

Common rue exhibits anti-inflammatory, antifungal, blood-activating and pain-relieving, wind-dispelling and detoxifying,

insecticidal and antipruritic, as well as antispasmodic effects. In specific, common rue effectively clears heat toxins from the body and reduces inflammatory responses, demonstrating significant therapeutic efficacy for conditions such as abscesses, sores, sore throat, and dysentery. Common rue demonstrates efficacy in alleviating rheumatic pain and joint discomfort, thereby improving joint mobility. Its distinctive aroma serves as an insect repellent, effectively deterring mosquitoes, flies, and other pests. Both the branches and leaves of common rue are utilized in herbal medicine for their ability to cool blood and dissipate blood stasis. The seeds of common rue can also be employed as sedatives and anthelmintic agents.

Other Applications of Common Rue

The fresh herb of common rue is used for relieving trauma-induced swelling, reducing inflammation, and detoxifying. The dried herb is used for promoting qi circulation, resolving blood stasis, and benefiting the liver, and serves as a flavoring ingredient. The yellow fresh flowers can be dried and are also excellent materials for flower arrangements. An infusion of the leaves can be used as an eye wash to alleviate fatigue. Additionally, common rue features bluish-green leaves and bright golden-yellow flowers, creating a striking color contrast that makes it suitable for cultivation as an ornamental foliage plant^[6–8]. As the national flower of Lithuania, common rue can be crafted into bookmarks, embodying significant literary and cultural aesthetic value^[9–10].

Conclusions

The primary pharmacological effects of common rue include anti-inflammatory, antifungal, blood-activating, and pain-relieving effects. It demonstrates efficacy in dispelling wind, relieving convulsions, promoting menstruation, and exerting insecticidal effects, while also clearing heat, detoxifying, cooling blood, and dispersing blood stasis. Furthermore, common rue can be used to treat diseases such as cold and fever, toothache, vomiting, abdominal pain, diarrhea, lower back and leg pain, and joint pain. It demonstrates significant therapeutic effects in both treatment and prevention. The aromatic oil extracted from common rue can be used as a flavoring ingredient, while its distinctive fragrance possesses insecticidal properties, making it effective for repelling insects. In China, records of common rue date back to the Han

Dynasty, when it was utilized in various fields such as medicine, food, and cosmetics. Additionally, common rue can serve as an ornamental plant, with its flowers being suitable for drying and serving as excellent materials for flower arrangements.

With the expanding applications of common rue in pharmaceuticals, food, daily chemicals, and landscaping, market demand is steadily increasing. Therefore, research on the cultivation technology of common rue and the achievement of large-scale planting hold significant importance. Currently, there are relatively few research reports on common rue both domestically and internationally. Through in-depth analysis of the active components, contents, and therapeutic effects of the whole plant and different parts of common rue, there is certain development and utilization value. It is believed that in the near future, new drugs with better efficacy will be developed, capable of generating certain economic value and social benefits.

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