Discussion on the Application Value and Chemical Constituents of **Hotan Rose:** A Medicinal and Edible Plant

Alimujiang Abulizi^{1,2}, R M Khalilov¹, Sh Sh Sagdullaev¹, Nurbolat Aidarhan^{2*}

1. Institute of the Chemistry of Plant Substances, Academy of the Sciences of Republic of Uzbekistan, Tashkent 700170, Uzbekistan; 2. State Key Laboratory of Xinjiang Indigenous Medicinal Plant Resource Utilization, Xinjiang Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, Urumqi 830011, China

Abstract Besides its ornamental value, Hotan rose is widely used in medicine, health products, cosmetics, food, essential oil and other fields. It is necessary to conduct in-depth research on its chemical constituents and pharmacological effects. This paper mainly discusses the application value and chemical constituents of Hotan rose, aiming at providing a certain basis for enhancing its application value and expanding its application fields.

Key words Hotan rose, Application value, Chemical constituents, Health care function

1 Introduction

Rose is a plant of the genus Rosa L. in the family Rosaceae, which contains more than 200 varieties^[1]. Roses are mainly cultivated in France, China, Uzbekistan, India and Pakistan. In China, it is mainly distributed in Xinjiang, Yunnan, Shandong, Sichuan, Gansu and other regions. Common varieties in China include Rosa rugosa Thunb., R. damascena Mill., R. setate, R. chinensis Jacq., R. platyacantha Schrenk., R. xanthina Lindl., R. albertii Rgl., R. banksiae Ait., R. multiflora Thunb., etc. [2].

Rose petals are dried petals of Rosaceae plants. They are harvested in spring and early summer and dried in the shade before removing impurities such as receptacle, calyx and decayed petals. This product is slightly obovate or fan-shaped, mostly wrinkled, wide at the top and narrow at the bottom, 0.8 - 2.0 cm long. The bottom end is awned and yellow, and the upper end is wide and light purplish to purplish. Radial textures and horizontal textures extending from bottom to upward can be seen on the surface of the petals. It is light in plant and brittle in texture. The aroma is strong, and the taste is slightly bitter and astringent.

Roses are increasingly widely used in clinic, food and health products. Traditional Chinese medicine uses rose buds as medicinal parts. The parts used for traditional Chinese medicine in Uyghur medicine are fresh rose petals when they are in full bloom. Rose petals are medicinal materials used in Uyghur medicine, and their Uyghur name is "Kizil gul", that is, "Keziliguli", that is, the legendary Hotan rose.

Hotan rose resources

ask rose. The rose producing area is mainly Hotan area, so it is

Hotan rose is a world-famous naturally optimized variety of Dam-

Received: September 13, 2024 Accepted: October 23, 2024 Supported by Scientific Research Project of Central Asia Drug Research and Development Center, Chinese Academy of Sciences (CAM202204).

called Hotan rose. The alias of Hotan rose is rose, wild rose, etc. Hotan rose has good quality, high flavonoid content, strong and long-lasting fragrance, and is one of the precious Chinese herbal medicines. It is included in the Standard of Uygur Medicinal Materials in Xinjiang Uygur Autonomous Region. Hotan rose is also the raw material of spice and food industry, and it is a traditional cultivated variety in Hotan, Xinjiang.

Hotan rose has high economic value and is widely used in medicine, food, cosmetics, health products, tea, essential oil and other fields. At present, the products that use Hotan roses as raw materials include rose oral liquid, rose sauce, rose tea, rose essential oil, etc., so it is a plant suitable for all ages, and can treat diseases and promote health^[3].

Application value of Hotan rose

- 3.1 Medicinal value In the Hotan area, Hotan roses begin to mature and come on the market in early May every year. Hotan rose is sweet, warm and slightly bitter, fragrant and non-toxic, and has the functions of regulating qi and nourishing blood, beautifying skin, clearing away heat and strengthening heart, relieving depression and moistening skin, promoting blood circulation and removing blood stasis, eliminating fatigue, strengthening stomach and relieving pain. Rose Oral Liquid is a traditional Chinese medicine approved by the State Food and Drug Administration, which is often used to improve symptoms such as palpitation, shortness of breath, fatigue, limb paralysis, stomach pain and vomiting. Rose flower water is mainly used to treat constipation, myocarditis, hepatitis, pale complexion and other symptoms^[4]. Rose sugar paste is also a traditional Chinese medicine approved by the State Food and Drug Administration, which is used to strengthen the stomach and relieve pain, harmonize blood and nourish blood, and regulate female endocrine.
- 3.2 Edible value Roses are used as flavoring and filling additives in the food industry, and can be used in naan cakes, pastries, rose sauce, rose juice, etc.
- 3.3 Daily chemical value Roses are widely used in daily

^{*} Corresponding author. E-mail: bolat@ ms. xjb. ac. cn

chemical products, for example, purified rose essential oil is used for making high-grade daily chemical products for daily use, including perfume, cosmetics, soap, *etc.* Rose essential oil is very expensive, and it is used for beauty care, ultraviolet damage, *etc.* Rose essential oil has a strong fragrance, and a small amount of essential oil can be added to make a high-end perfume ^[5].

3.4 Health care function Rose eye drops made of Hotan rose have curative effect on corneal and conjunctival inflammation, and have little irritation, which can relieve fatigue, dry eyes and other uncomfortable symptoms. There are also rose essential oil soft capsules, rose tea, *etc.*, which have the functions of regulating mood, beauty and endocrine regulation.

4 Chemical constituents of Hotan rose

Phytochemical studies have shown that Hotan rose is rich in flavonoids, phenolic acids, volatile oils, vitamins, amino acids and other chemical components.

- **4.1 Flavonoids** Rose leaves are rich in flavonoids. At present, the flavonoids found mainly include quercetin, kaempferol, rutin, quercitrin, hyperoside, juglanin, astragalin, avicularin, luteolin, eriodictyol, morin, myricin, chrysin, sakuranetin, apigenin, naringin, prunetin, *etc.* [6-7].
- **4.2 Volatile oil components** Rose is a plant of Rosaceae with unique aroma and rich volatile oil. Rose volatile oil is also known as rose essential oil. Its volatile oil components mainly include eugenol, 4-methoxypentenol, β -phenylethanol, etc., among which β -phenylethanol is the main component of rose floral fragrance. In addition, there are volatile oil components such as linalool, β -citronellol, and methyl eugenol [8]. Qian Zonghui etal. used GC-MS analysis technology to analyze the fatty acids contained in Hotan rose, and identified 18 fatty acid compounds such as citronellol, aromadendrene, 2-tridecanone and isoeugenol methyl ether [9].
- **4.3 Phenolic acids** Rose petals are rich in phenolic acids, and known phenolic acid compounds include vanillic acid, gallic acid, ferulic acid, p-coumaric acid, syringic acid, methyl gallate, ascorbic acid, *etc.* Using LC-MS analysis technology, isoferulic acid, trans-sinapic acid, rosmarinic acid, salicylic acid, veratric acid, 3, 4, 5-trimethoxyphenylacetic acid, 2, 3-hydroxybenzoic acid, 3, 4-dimethoxycinnamic acid, *etc.* were identified in rose fruits and leaves^[10-11].
- **4.4 Vitamins and amino acids** Hotan rose is rich in vitamins, such as vitamins A, B, C, E, K, and also contains tannic acid, among which vitamin C has the highest content, which is 8 times that of Chinese kiwifruit; rose residue contains lysine, leucine, isoleucine, methionine, phenylalanine, threonine, tryptophan, valine and other essential amino acids^[12].

5 Pharmacological studies on Hotan rose

5.1 Antioxidant effect Hotan rose contains polyphenols, flavonoids, polysaccharides and essential oils, as well as a high content of vitamin C. As antioxidant substances, polyphenols and fla-

vonoids of Hotan rose can scavenge free radicals and pigmentation, and vitamin C has good antioxidant and free radical scavenging effects. Hotan rose flowers (generally referred to as petals and buds) have strong and good free radical scavenging effects, especially anthers in flower buds, whose antioxidant capacity is significantly higher than that of other parts^[12]. Rose polysaccharide has good antioxidant activity and remarkable efficacy in scavenging superoxide anion and hydroxyl radical^[13].

- **5.2** Antibacterial effect Rose has a certain antibacterial effect. Studies have shown that 0.25% concentration of rose essential oil can inhibit *Proteus*, *Escherichia coli*, *Staphylococcus aureus* and *Bacillus subtilis*; it has inhibitory activity on *Helicobacter pylori* and *Candida*^[15].
- **5.3 Anti-tumor effect** Studies have shown that polysaccharides have anti-tumor effects in Hotan roses, and roses can improve antioxidant capacity and human immunity.
- **5.4** Antihyperlipidemic effect He Xi *et al.* found that rose flavonoids can significantly increase the level of high-density lipoprotein cholesterol. Experiments on mice have shown that it can reduce the levels of total cholesterol and triglyceride in rat serum to achieve the effect of lowering blood lipids^[16-17].
- **5.5 Lipid-lowering effect** Feeding fruit flies with different concentrations of rose water extract can obviously prolong the life span of fruit flies, and the life span of fruit flies will be longer with the increase of concentration. The treatment groups with obvious effects are 0.10%, 0.25%, 0.50%, 1.00%, but the treatment group with 5.00% concentration can obviously shorten the life span of fruit flies. The experimental results show that the proper amount of rose water extract has anti-aging effects^[18].

6 Conclusion

The research results show that Hotan rose has the effects of relaxing tendons, promoting blood circulation, tonifying qi, relieving depression and regulating middle energizer, and can be used as a substitute for saffron to treat gynecological diseases, and its root bark can be used as a dye for silk. Therefore, the efficacy of Hotan rose has gradually attracted attention. Taking the active ingredients and biological functions of Hotan rose as the starting point, this paper deeply studies the further application of the active ingredients and curative effects of Hotan rose in the fields of food, health products and medicines. It is believed that new products for treating related diseases will be developed in the future, and it will create certain social and economic value, which is of great significance to the promotion of the value of Hotan rose.

References

[1] NADPAL JD, LESJAK MM, SIBUL FS. Comparative study of biological activities and phytochemical composition of two rose hips and their preserves: Rosa canina L. and Rosa arvensis Huds [J]. Food Chemistry, 2016, 192: 907 – 914.

- spondylolisthesis and spinopelvic sagittal parameters [J]. Journal of Xuzhou Medical University, 2021, 41(1): 35 38. (in Chinese).
- [40] MA JF. Correlation of spine-pelvis sagittal position parameters with surgical efficacy and postoperative low back pain after lumbar spine fusion [D]. Tianjin:Tianjin Medical University, 2020. (in Chinese).
- [41] ARIJA J, PHILIPP S, ESRA A, et al. Relation between sagittal pelvic and thoracolumbar parameters in supine position – Pelvic parameters and their predictive value for spinal Cobb angles [J]. Brain Spine, 2024. 5(4): 102779.
- [42] YANG ZX, YU M, ZHAO WK, et al. The characteristics of sagittal alignment of spine-pelvis in lumbar disc herniation in patients under 35 years old[J]. Chinese Journal of Minimally Invasive Surgery, 2023, 23 (4): 272 – 275. (in Chinese).
- [43] PAN JJ, LI GJ, HAO WQ, et al. A study of the changes in spinal-pelvic sagittal parameters before single-segment LSS and analysis of the factors influencing them[J]. Zhejiang Journal of Traumatic Surgery, 2023, 28 (2): 240 - 242. (in Chinese).
- [44] GUO AN, CHEN SQ, YAN ZH, et al. Correlation between Sagittal Spino-pelvic Alignment and Lumbar Disc degeneration in Asymptomatic Chinese Adults[J]. Journal of Medical Research, 2021, 50(6): 136 – 149. (in Chinese).
- [45] LU SW, LU LJ, WANG XD, et al. Biomechanical study on the effect of simulated lever positioning manipulation on the stability of lumbar posterior joint[J]. Zhejiang Journal of Traditional Chinese Medicine, 2015, 50(4): 245-246. (in Chinese).

- [46] LU LJ, XIE YX, CHEN YF, et al. A clinical research on the effect and the influence on pelvic parameters of lever positioning manipulation in treating patients with lumbar disc herniation [J]. Journal of Zhejiang Chinese Medical University, 2019, 43(7); 640-644. (in Chinese).
- [47] ZHANG HY, MAO YL, LU LJ. Research on the changes of sagittal parameters of spine and pelvis in patients with adolescent idiopathic scoliosis based on lever positioning manipulation [J]. China Modern Doctor, 2022, 60(4): 147-150. (in Chinese).
- [48] XIE YX, LU LJ, DU HG, et al. A clinical study of lever positioning manipulation for treatment of lumbar disc herniation [J]. The Journal of Traditional Chinese Orthopedics and Traumatology, 2021, 33(3): 1 – 5. (in Chinese).
- [49] MOU CL, SHEN XN, LI GF. Therapeutic effect of Chinese orthopaedic manipulation combined with external application of traditional Chinese medicine to improve lumbar curvature in lumbar intervertebral disc herniation[J]. Lishizhen Medicine and Materia Medica Research, 2020, 31 (5): 1179-1183. (in Chinese).
- [50] JIANG Q, DING Y, LIU JY, et al. Finite element simulation and biomechanical analysis of fully endoscopic precisely laminectomy decompression [J]. Chinese Journal of Tissue Engineering Research, 2020, 24 (12): 1891 – 1896. (in Chinese).
- [51] NAVAB N, MARTIN-GOMEZ A, SEIBOLD M, et al. Medical augmented reality: Definition, principle components, domain modeling, and design-development-validation process [J]. Journal of Imaging, 2022, 9 (1):4.

(From page 106)

- [2] LIU YM, SHAWUTI YIKEMU. Uyghur Pharmacognosy [M]. Urumqi: Xinjiang Science and Technology Health Publishing House, 1999. (in Chinese).
- [3] RUXIANRU MAIMITIMING. Application of rose in Uyghur medical treatment[J]. Journal of Medicine & Pharmacy of Chinese Minorities, 1999(3): 27. (in Chinese).
- [4] State Administration of Traditional Chinese Medicine, Chinese Materia Medica Editorial Committee. Chinese Materia Medica (Volume 8) [M]. Shanghai; Shanghai Science and Technology Press, 1999. (in Chinese).
- [5] LIU ZH, SAN CH, LU L, et al. Rose essential oil of processing technology [J]. Farm Products Processing, 2006, 11 (82): 75 77. (in Chinese).
- [6] XIAO ZP, WU HK, WU T, et al. Kaempferol and quercetin flavonoids from Rosa rugosa[J]. Chemistry of Natural Compounds, 2006, 42(6): 736-737.
- [7] OLECH M, PIETRZAK W, NOWAK R. Characterization of free and bound phenolic acids and flavonoid aglycones in *Rosa rugosa* Thunb. leaves and achenes using LC-ESI-MS/MS-MRM methods [J]. Molecules, 2020, 25(8): 1804.
- [8] LIU YM, LIU KF. Study of chemical components of rose essential oil grown in Xinjiang[J]. Fine Chemicals, 2002,19(7): 388 - 389, 405. (in Chinese).
- [9] QIAN ZY, LI J, WANG C. Analysis of volatile compounds from flower of Rosa rugosa Thunb with solid phase microextraction by GC/MS[J]. Modern Scientific Instruments, 2013, 30(6): 108 – 111. (in Chinese).

- [10] CHEN GL, CHEN SG, XIAO Y, et al. Antioxidant capacities and total phenolic contents of 30 flowers [J]. Industrial Crops and Products, 2018. 111 · 430 – 445.
- [11] HUANG WS, MAO SQ, ZHANG LQ, et al. Phenolic compounds, antioxidant potential and antiproliferative potential of 10 common edible flowers from China assessed using a simulated digestion-dialysis process combined with cellular assays [J]. Journal of the Science of Food and Agriculture, 2017, 97 (14): 4760 4769.
- [12] SHAO DW. Study on the antioxidations capcity of Rosa rugosa flower bud[D]. Tai'an: Shandong Agricultural University, 2008. (in Chinese).
- [13] DU J. Comprehensive utilization of rose oil post-products[D]. Urumqi: Xinjiang Agricultural University, 2006. (in Chinese).
- [14] BAI WF. Study on the extraction and activity of rose polysaccharide [D]. Jinan; Shandong Institute of Light Industry, 2010. (in Chinese).
- [15] YU F. Extraction, analysis and application of rose essential oil [D]. Nanchang: Nanchang University, 2011. (in Chinese).
- [16] HE X, HAN N. Extraction of flavones from rose by supercritical CO₂ extraction method and research on its healthy function [J]. Journal of Anhui Agricultural Sciences, 2009(26): 12699 12700. (in Chinese).
- [17] HE X. Research on the new process of extraction of rose essential oil and related animal experiments[D]. Jinan; Shandong Normal University, 2002. (in Chinese).
- [18] LONG G. Toxicology and anti-aging efficacy of rose water extract[D]. Guangzhou; South China Normal University, 2005. (in Chinese).