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# Literature review: Phytochemical content, pharmacology and ethnobotanical of Genus Rosa in Asia

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## Abstract

One type of plant that has the potential to be utilized in pharmacology and industry is roses. Roses or *Rosa sp.* is one of Rosaceae family which contains many chemical compounds. But the utilization is not diverse, just focusing on the flower part. In addition, research related to the content of phytochemical compounds contained in rose plants has not been widely explored so that its potential as a therapeutic agent has not been widely utilized in the pharmacology industry. Therefore, the purpose of this review is to collect information related to the phytochemical content and its potential as pharmacology of various types of rose species in the Asian and its potential as ethnobotany. The method used in this review paper is to collect data through literature studies from previous research. Furthermore, after the information gathering process, it can be seen that the content of phytochemical compounds from the Rosa genus is dominated by phenolic compounds which include flavonoids, tocoferol, tannins, saponin, anthocyanins and ascorbic acid. These compounds are also capable of causing therapeutic effects in the pharmacology industry. Some of the pharmacological properties that appear include antioxidant, antibacterial, anti-inflammatory and antidiabetic. In addition, the hereditary utilization of the Rosa genus in the Asian ethnobotanically also varies greatly.

**Keywords:** Ethnobotany; Phytochemistry; Pharmacology; Rosa sp

## 1. Introduction

Along with the times, the industrial field utilizes many plants as the basic ingredients of a product in the form of medicines, cosmetics and food. Plants naturally have certain compounds that can be used to support human health. These plants will be processed through various processes both chemically and biologically to obtain the extraction results and used as herbal medicines. In recent years, herbal medicines have been widely chosen by the public because they have several advantages, including having therapeutic effects and not causing prolonged side effects [1].

In tropical country there are many various types of plants that have the potential to be utilized in pharmacology and the beauty industry. That plant is roses. *Rosa sp.* one of the Rosaceae family that contains many chemical compounds that are useful as medicines and basic ingredients for cosmetics [2]. In general, *Rosa sp.* used as a raw materials from the cosmetics industry. Some cosmetics that utilize rose flowers is rose water. It trusted by the community as a type of facial treatment because rose flowers are believed to be able to relieve skin problems such as redness and acne [3]. In addition, rose flowers are also used as perfumes or fragrances because rose flowers have a distinctive fragrance. Rose flowers have various scents depending on the type of species and habitat, because the scents of rose flowers comes from the specific content known as essential oils [4].

In Indonesia, the utilization of rose plants only focuses on the flowers. This is due to the lack of research related to the exploration of phytochemical compounds contained in rose plants. In addition, it is also due to the lack of exploration of the types of rose species in Indonesia, so that the utilization of rose plants is only fixated on one species, namely *Rosa*

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*damascena*. Initially, roses originated from the plains of China, the Middle East and Eastern Europe [5]. By the time, it has spread widely to several countries on the Asian, East America and North America [6]. In Europe, East Asia and South Asia rose plants are widely used as traditional medicine to treat various problems related to liver, kidney, lung, heart and digestive health [7],[8].

In recent times, the pharmacological activity of rose plants is very promising, because the relatively fast growth and reproduction process also makes it an alternative material in the industrial world. Thus, the purpose of this review is to collect information related to the phytochemical content of various types of roses in Asia that have pharmacological activities and their potential as ethnobotany.

## 2. Morphology and classification of *Rosa sp.*

*Rosa sp.* is one type of ornamental plant that has special characteristics, which has a woody and thorny stem, has a height of up to 2 meters which is included in the bush habitus type, has compound type leaves with pinnate leaf reinforcement, has compound flowers with bell-shaped petals, has a taproot type, has round and brown seeds and has an oval-shaped fruit [3]. *Rosa sp.* also has a variety of colors on its petals i.e. white, red, pink, yellow petals and so on. In Indonesia, the most common rose species is *Rosa damascena* (Figure 1B), but the varieties of *R. damascene* are quite diverse. The following is a morphological description of one of the species of the genus Rosa and that classification.

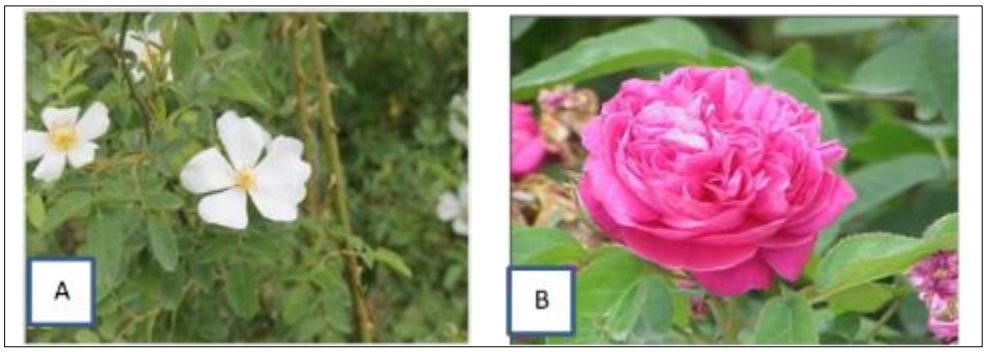


**Figure 1** (A) *Rosa canina* [8] (B) *Rosa damascene* [9]

- Kingdom : Plantae
- Division : Tracheophyta
- Class : Magnoliopsida
- Order : Rosales
- Family : Rosaceae
- Genus : Rosa
- Species : *Rosa sp.* [6]

## 3. Phytochemicals of the genus rosa

Based on the morphology, rose flowers have different colors on the flower crown. Some rose flowers are red due to the content of color pigments in the form of anthocyanins. In addition, *Rosa sp*. also has a distinctive scent compared to other flowers. The scent is due to the content of essential oils with the main component in the form of 2-phenyethyl alcohol [5]. Apart from being a color pigment, anthocyanin compounds also function as antioxidant substances that can capture free radicals [9]. In addition, the flower petals also contain ascorbic acid or vitamin C which is quite high and also has the potential as an antioxidant substance [10]. In addition, the types of phytochemical content of various types of the Rosa genus and related plant body parts will be discussed further in Table 1.

**Table 1** Phytocemical Compound from Genus Rosa

| Spesies | Phytochemical Compound | Part of Plant | References |
|---|---|---|---|
| *Rosa damascena Mill* | Anthocyanin | Flower | [5] |
| | Ascorbic acid | | |
| | Phenolic | | |
| | Tannin | Buds and flower crown | [11] |
| | Saponin | | |
| | Flavonoid | | |
| | Cyanin 3-O-glucoside | Flower crown (Petals) | [12] |
| | Eiocosane | Flower crown (Petals) | [4] |
| | Phenyl ethyl alcohol | | |
| *Rosa canina* | Ascorbic acid | Fruit | [6] |
| | Flavonoid | | |
| | Phenolic | | |
| | Catechin I | Buds and seeds | [12] |
| | Epicatechin I | Leaves | |
| | Epicatechin II | Buds and seeds | |
| | Epicatechin gallate | Leaves | |
| | Amentoflavone | Buds and seeds | |
| | Myricetin | Fruit | |
| *Rosa rugorose* | Campferol | Trunk, leaves, flower and fruit | [12] |
| | Catechin I | Root | |
| | Procyanidin B-three | Root | |
| | Tellimagradin I | Flower crown (Petals) | |
| | Tellimagradin II | Flower crown (Petals) | |
| *Rosa multiflora* | (+)- pinoresinol | Root | [12] |
| | (+)-eight-hydroxpinoresinol | Root | |
| | (-)- dehydrodiconiferyl alcohol | Root | |
| | (-)-olivil | Root | |
| *Rosa hybrda L.* | β-phenylethyl acetate | Flower crown (Petals) | [13] |
| | 2-isopropyl-5-methyl-9-methylene-bicyclo-1-decene | | |
| | Nonadecane | | |
| *Rosa sericea* | Antosianin | Flower | [12] |
| | Flavonoid | Flower crown (Petals) | [14] |
| | Gallicin-p-O-(six'-O-caffeoyl)-β-D-glucoside | Leaves | [15] |
| | Rubanthrone | Leaves | |

## 4. Pharmacology of the genus rosa

Based on the content of secondary metabolite compounds that have been identified, it can be seen that the Rosa genus is dominated by phytochemical compounds derived from the phenolic group. Phenolic compounds are one type of compound produced by plants through the secondary metabolite process. Phenolic compounds have special characteristics that can be characterized by the presence of aromatic rings containing one or two hydroxyl groups (OH) [16]. Phenolic compounds have benefits as antioxidants, anticarcinogenic and antimicrobial [16]. Thus, with the high content of phytochemical compounds from the Genus Rosa, this plant can be utilized as a therapeutic agent in the industrial world. The following is the pharmacological potential of the Rosa Genus:

**Table 2** Pharmavological Phytochemical Compounds of Rosa Genus

| Spesies | Phytochemical Compound | Part of Plant | References |
|---|---|---|---|
| *Rosa damascena Mill* | Hypnotic | Root, trunk, leaves, flowers | [17] |
| | Analgesics | Root, trunk, leaves, flowers | [18] |
| | Antibacterial | Flowers | [3] |
| | Antidiabetics | Flowers | [19] |
| | Antioxidants | Leaves and Flowers | [2] |
| *Rosa canina* | Antihyperglycemia | Fruit | [20] |
| | Anti inflamatory | Fruit | [21] |
| *Rosa indica* | Anticancer | Leaves, trunk, fruit | [22] |
| *Rosa multiflora* | Antianalgesic | Fruit | [23] |

From Table 2. genus Rosa can be utilized as an anesthetic that has a hypnotic effect. The hypnotic effect will work to affect the central nervous system in humans or animals. The hypnotic effect is due to the presence of flavonoid and terpene compounds. Where, flavonoids are one type of secondary metabolite compound that has anxiolytic and antidepressant activity [9]. In addition, the Rosa genus also mostly has properties as an anti analgesic. Analgesic effect arises due to the content of phytochemical compounds that act as antioxidants. In mechanism antioxidant can reduce pain. So, Genus Rosa can be used as a pain killer or as an anti analgesic agent as well as anti-inflammatory [18];[23]. Then, the phytochemical content in the Rosa genus can also function as an antidiabetic. Methanol extract from *Rosa sp.* is able to inhibit the performance of the enzyme α-glucosidase and suppress intestinal absorption of carbohydrates, thus reducing postprandial glucose levels that accumulate in the blood [19]. Furthermore, *Rosa sp*. plants also have antibacterial properties. Where, the chemical content of citronellol, geraniol and nerol is known to be able to inhibit the activity of microorganisms. In addition, this antibacterial property is also caused by the content of phenylethyl alcohol which is antimicrobial [9].

In addition, the dominating pharmacological property of the Rosa genus is its role as an antioxidant. Where, antioxidants are one of the effects of many phytochemical compounds that are able to inhibit free radicals. In general, free radicals will be generated continuously by body cells as a side effect of normal cell metabolic processes. Thus, without antioxidant substances, some functions of body cells will be damaged and lead to the occurrence of degenerative diseases [5]. In natural conditions in plants, these antioxidant properties are spread almost throughout the plant body. Where, these antioxidant properties are due to the presence of phytochemical compounds in the form of α- tocopherol, quercetin-3-O-glucoside, kaempferol-3-O-rhamnoside and kaempferol3-O- arabinoside [9].

## 5. Ethnobotany of the genus rosa

Traditionally, the treatment applied often uses herbal ingredients derived from plants. Knowledge of the benefits of medicinal plants can prosper humans in the process of applying them to the fields of medicine, cosmetics and food. Thus, research related to compound components and their benefits continues to grow over time. The rose plant group of the genus Rosa is included in the category of medicinal plants, because each part of the plant body has its own function. Ethnobotany of the genus Rosa in Asia, will shown in Table 3.

**Table 3** Ethnobotanical Application of Genus Rosa in Asia

| Species | Ethnobotany | Part of Plants | Location | References |
|---|---|---|---|---|
| *Rosa damascena Mill* | Food dyes | Flower | Indonesia | [24] |
| | Rose water | Flower | | [5] |
| | Gonorrhea disease | Flower | India | [25] |
| | Cough medicine | Flower | | [26] |
| | Skin disease | Flower | | |
| | Diarrhea medicine | Leaves | | [27] |
| | Fever medicine (malaria) | Flower | | [28] |
| | Pain killer | Flower | Iran | [29] |
| | Facilitating menstrual cycle | Flower | | |
| | Digestive medicine | Flower | | |
| | Shortness of breath medicine | Flower | India | [30] |
| *Rosa canina* | Digestive medicine | Root, Leaves, Flower and Fruit | Iran | [31]; [32]; [33]; [34] |
| | Anemia | | | |
| | Hypertension | | | |
| | Insect bite reliever | | | |
| | Antidepresan | | | |
| | Kidney disease medicine | | | |
| | Anticholesterol | | | |
| | Blood pressure lowering medicine | | | |
| | Antidiabetic | | | |
| | Skin disease | | | |
| *Rosa alba L.* | Relieves swollen eyes | Flowers | India | [35] |
| *Rosa centifolia L.* | Burn medicine | Flower crown (Petals) | India | [27] |
| | Eye disease | | | |
| | Syphilis | Flowers | | [8] |
| | Anemia | Seeds | | [36] |
| *Rosa chinensis* | Nosebleeds | Leaves and flowers | India | [37] |
| | Fracture medicine | Flowers | China | [38] |
| | Traumatic injury | | | |
| | Diarrhea | | | |
| | Enteritris | | | |
| | Pain killer | | | |
| *Rosa indica L.* | Dysentery Medicine | Seeds | India | [39] |
| | Headache medicine | Flowers | | [40] |
| | Diarrhea | | | |

| | | | | |
|---|---|---|---|---|
| | Dyspapsia | | | |
| | Insect bite reliever | Leaves, trunk, fruit | | [22] |
| | Increase fertility | | | |
| | Dysentery | | | |
| *Rosa macrophylla Lindl.* | Cough medicine | Roots | | [41] |
| | Liver disease medicine | Flowers | India | [42] |
| | Pain killer | | | [43] |
| *Rosa multiflora* | Epilepsy medications | Flowers | India | [44] |
| | Insomnia | | | |
| *Rosa beggeriana* | Hypertension medicine | Fruit | China | [45] |
| | Kidney disease medicine | | | |
| *Rosa foetida* | Diabetes medication | Flowers | Iran | [46] |
| | Pain killer | | Pakistan | [47] |

## 6. Conclusion

Based on these data, it can be concluded that the Rosa genus has various types of phytochemical compounds. Some of them are dominated by phenolic compounds which include flavonoids, tocoferol, tannins, sponin, anthocyanins and ascorbic acid. These compounds are also capable of causing therapeutic effects in the pharmacology industry. Some of the pharmacological properties that dominate are its antioxidant, antibacterial, anti- inflammatory and antidiabetic. In addition, the ethnobotanical utilization of the Rosa genus in the Asian is also very varied.

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