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OMELO (CITRUSMAXIMA)PEEL IS RICH IN FLAVONOIDS/ESSENTIAL OILS AND MAKE A COMPELLING NATURAL ANTIFUNGAL, ANTIOXIDANT, ANTI-INFLAMMATORY AND COSMETIC APPLICATIONS: A SOURCE FOR ANTI-DANDRUFF SHAMPOO DEVELOPMENT

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ABSTRACT

Citrusmaxima fruit is the largest citrus fruit belonging to the family Rutaceae, which is native to South -East Asian countries. They are also known as shaddock and pummelo. It had big round-shaped edible fruits with pink or white flesh. It is a favourite addition to many Asian festival meals. It consists of pharmacological and medicinal properties. It is useful in the treatment of various diseases like microbial diseases, diabetes, oxidative stress, hepatic damage, algeria, inflammation and as depressant etc. They are rich in various sources like vitamins, minerals, and phytoconstituents such as courmarins, benzenoids, steroids and citrus acid. Citrusmaxima has been recommended in traditional herbal medicine as anti-diabetic agent in management of diabetes. It has been used as a folk medicine in several countries as antifungal, antimicrobial, antioxidants, larvicidal, hepatoprotective, anti-cancer, anti-platelet, anti-diabetic and anti-inflammatory. In addition to this, fruits of pomelo are also reported to be used in industries dedicated to perfume, cosmetics, food and pharmaceuticals as flavouring or fragrances-enhancing agents. Antifungal activity of pomelo peel are rich in composition of bioactive compounds like; D-Limonene, flavonoids that can be effectively incorporated into shampoo for treating conditions like dandruff. Candida albicans and Malassezia furfur that can be inhibit the growth of common fungi.

KEYWORD: Anti-microbial, Anti-oxidants, Anti- cancer, Anti-diabetic and Anti-fungal.

1. INTRODUCTION

As we know that India is well known for its ayurvedic medicines from centuries from plants[1], one of these is Citrusmaxima. Citrusmaxima (pomelo) belonging to the family Rutaaceae and is characterized by its large ,spherical to pear –shaped fruits, thick rind and sweet to slightly tangy pulp. It is a perennial plant commonly known as Pomelo, Bhagate, Papanus, Pummela etc. The plant Citrus grandis (pomelo), popularly known as Chakota in India. It is grown in tropical, sub- tropical and temperate region. The fruits is predominantly cultivated in southeast Asian nations such as Thailand, Malaysia, Indonesia, Japan, India, China and many other Asian countries.[2] It grown in temperatures 25-32°C and rainfall 1500-2500 mm, within a 3-4 months dry season.[3] The fruit like all citrus fruits, are filled with juicy sacs (vesicles), shaped like tear drops. It has big round–shaped edible fruits with pink or white flesh. The peel and pulp can be easily separated from each other. The pulp is generally pink or white in colour and coarse with large juice sacks which includes approximately 160 genera and 1700 species and has been widely used in herbal medicine.[4]

1.1 Local names[5]

Table 1: Some common names of Citrusmaxima.

Language	Common name
Nepali	Bhogate
Hindi	Sadaphal, Batawi nimbu, Cakotra
English	Pummelo, shaddock, pumelo
Sanskrit	Madhukarkati
Italian	Pompelmo
French	Pamplemousse
Portuguese	Jamboa
Spanish	Pamelmusa
Polish	Pompela
Indonesian	Jeruk Besar, Jerukbali

1.2 Taxonomical classification[6]

Table 2: Taxonomical classification of Citrus maxima.

Kingdom	Plantae
Phylum	Tracheophyta
Division	Magnoliophyta
Class	Magnoliopsida
Subclass	Rosidae
Order	Sapindales
Family	Rutaceae
Subfamily	Aurantioideae
Genus	Citrus
Species	Maxima

2. BOTANICAL DESCRIPTION OF THE FRUIT

The Pomelo is the biggest fruit among the Citrus family. The fruits ranges from nearly round to oblate or pear shaped; 10-30 cm wide; the peel, clinging, easily removed, greenish yellow or pale yellow, minutely hairy, dotted with tiny green glands.

Pomelo peel is the largest and the thickest of all Citrus fruits weighing up to 30% of the fresh fruit's weight. Pulp Varies from greenish yellow or pale yellow to pink or red and it is divided into 11 to 18 segments .The flavour of this fruits of pulp varies from mildly sweet and bland to sub acid or rather acidic, and sometimes with a hint of bitterness. The segments of the pomelo are covered with a tough skin called the lamella, it contain few seeds (yellowish white seeds).The flavedo are present in the rind of the fruits is green with oil glands appearing as spots all over the fruits peel and the albedo is white with a spongy texture.[6]

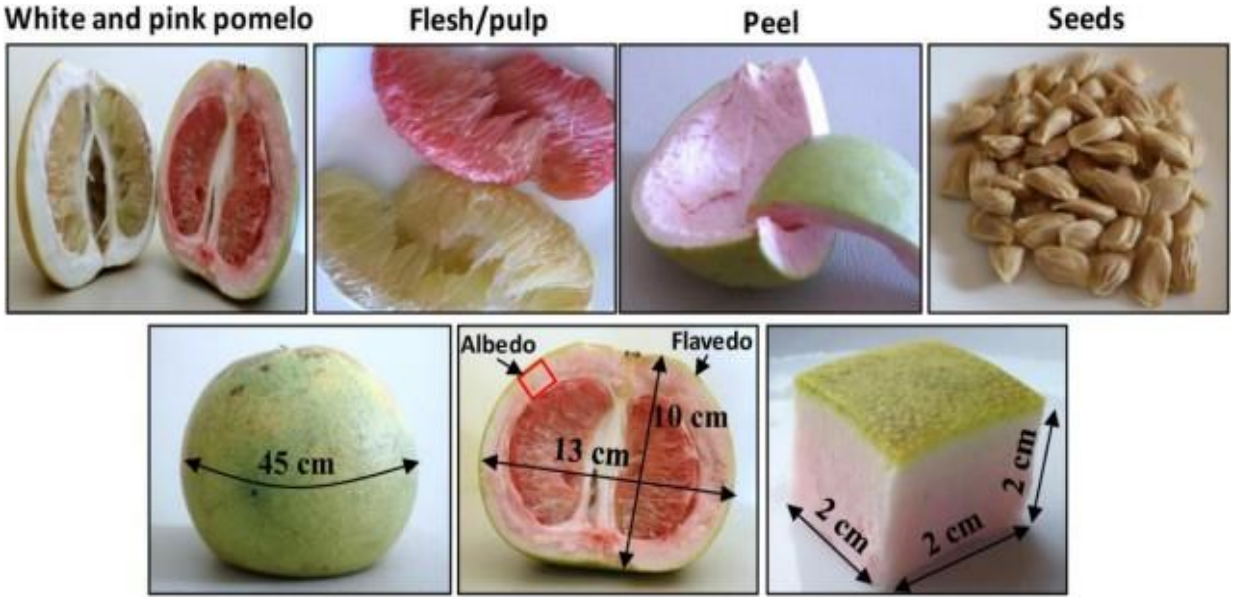

Fig 1: Anatomy of typical Pomelo fruit.

3. Nutritive value of the fruits

Pomelo fruits is rich in powerful antioxidants like vitamin C. It also contains protein and fiber, which can aid digestion and help for a longer periods of time after eating.[7]

3.1 Macronutrients

Table 3: Proximate composition per 100 g of Edible Portion (Fruit juice) of Citrusmaxima.

Proximate Composition	Value / 100g
Moisture	84.82-94.1 g
Energy	38 kcal
Protein	0.76 g
Fat	0.04 g
Carbohydrates	9.62 g
Dietary Fiber	1 g

3.2 Vitamins

Table 4: Vitamin composition per 100 g of Edible Portion (Fruit juice) of Citrusmaxima.

Vitamins	Value/ 100g
Vitamin A	20 I.U.
Thiamine (B1)	0.034 mg
Riboflavin (B2)	0.02 mg
Niacin (B3)	0.22-0.3 mg
Ascorbic acid	61 mg
Vitamin B6	0.036 mg

3.3 Minerals

Table 5: Mineral composition per 100 g of Edible Portion (Fruit juice) of Citrusmaxima.

Minerals	Value / 100g
Sodium	1 mg
Phosphorus	17 mg
Iron	0.11 mg
Magnesium	6 mg
Manganese	0.017 mg
Potassium	216 mg
Zinc	0.08 mg
Calcium	21-30 mg

4. Phytochemical Constituents

Every plant species is known to possess specific metabolites characterized as primary or secondary depending upon their synthesis, production and function. Golden yellow or red to pink colored appearance of pulp as well as peel of Pomelo is attributed to presence of secondary metabolites i.e. carotenoids.[8] The peel as well as pulp of citrus fruit has been reported to contain more than 115 different carotenoids. On a comparative account juice of pulp of red- fleshed pomelo possesses about 7 times high β-carotene, lycopene compared to peels of the fruits.[9] Beside common primary metabolites (common to all plant species) such as cellulose, hemicellulose, lipids, and sugars many secondary metabolites are also present. Flavonoids are an important class of secondary metabolites found to be present in pomelo.[10] Flavonoids reported to be present in species include hesperidin, neohesperidin, naringenin, naringin, and rutin.[11] Several studies conducted have studied qualitative as well as quantitative properties of different metabolites and phytocompounds synthesized in Citrus maxima.[12] It analyzed Vitamin C through the technique of 2, 6-dichlorophenolindophenol and reported the plant to be rich in synthesis and production of vitamin C. Besides a prominent source of ascorbic acid, Citrus grandisalso contains other economically valued metabolites with nutritive value, health-benefiting effects, etc. such as carotenoids, limonoids, acridone alkaloids, flavonoids, minerals, oils, vitamin B complex.[13-16] In addition to this, studies have reported the fruit juice tocontain benzenoid such as diphenylamine; Flavonoids such as diosmin, hespeidin, luteolin, naringin, narirutin, neodiosmin, neoeriocitrin, neohesperidin, neoponcirin, quercitin, rhoifolin and sinensetin. Triterpenes such as limonin, deoxylimonin, nomilin and obacunone were found in seeds, fruit pulp and juice. Miscellaneous compounds such as ascorbic acid and citric acid were also found in the fruit juice.[17]

5. Medicinal Uses

Studies revels that Citrusmaxima fruit juice and peel are very nutritive and have good medicinal properties.[18] The Pomelo pulp and peels are used as appetizer, stomach-tonic, cardiac stimulant in cardiovascular conditions and also in coughs. The fruit-juice has potential in enhancing weight loss and promoting cholesterol reduction.[19] The Pomelo peel extracts shows hypolipidemic, hypoglycemic, anti-oxidative, anti-microbial, anti-inflammatory and anti-cancerous properties.[20] Pomelo fruits are also reportedly used in diseases like leprosy and asthma. They have been proven helpful in the management of cough, mental aberration and epilepsy. In addition, the rinds have been found effective as anti-asthmatic, sedative, brain tonic, and in relief of headaches and eye troubles.[21] It's also reported to be the most used parts in traditional medicine for treatment of vomiting and diarrhea.[22] The seeds are utilized against dyspepsia, coughs and lumbago and its fruit is also used in the treatment of cancer and gastrointestinal disorders.[23]

6. Pharmacological Action

6.1 Anti-diabetic activity

Diabetes is a condition where the pancreas produce insufficient amount of insulin or when the body unable efficiently use of the insulin or both. The antidiabetic property of Citrusmaxima was studied on alloxan induced diabetic rats. Ethyl acetate, alcoholic and dried juice extracts of the fruits showed highly significant antidiabetic activity that involves reducing blood glucose levels in individuals with diabetes to manage the symptoms and risks of diabetes-related complication.[24]

6.2 Anti-inflammatory activity

Anti-inflammatory activity is related to substance that work by reducing inflammation in the body. Anti-inflammation helps to alleviate symptoms of inflammation such as redness, swelling and pain.[25] The anti-inflammatory potential was assessed through paw edema of rats induced by formalin. Among different extracts studied, ethanolic extract prepared from mentioned plant parts of C. maxima potentially exhibited decreased writhes in animals compared to that obtained in control along with an increase in time of tail flicking. Also, the results of ethanolic extract were comparable to that of diclofenac.[26-27]

6.3 Anti-oxidant activity

Anti-oxidant activity is an activity that can reduce or inhibit the oxidation reactive species or free radical.[28] C. maxima is among the well-known plant to possess anti-oxidant properties. The plant juice when consumed is believed to improve anti-oxidant ability reducing the risk of possible oxidative stress. C. grandis being identified as a potential anti-oxidant source is due to the presence

of metabolites including polyphenols, vitamin C, flavonoids, etc. Such metabolites have been reported to acts as neutralizers of free radicals and hence provide protection against oxidative stress. Besides anti-oxidant activity, C.maxima also depict an inhibitory role against α- glucosidase, tyrosinase, α-amylase, and acetyl cholinesterase.[29-30] These compounds effectively counteract the effects of free radicals, with polyphenols being the key component preventing oxidative damage. Oxidation stress is an outcome of free radicals, and C. grandis contains flavonoids, ascorbic acid and polyphenolic substances that primarily prevent this damage by scavenging free radical.[31]

6.4 Anti-microbial activity

The anti-bacterial activity of C. maxima has been widely studied. The ethanolic leaf extract exhibited anti-bacterial activity against Pseudomonas aeruginosa and Escherichia coli.[32] The ethanolic pulp and seed extracts also exhibited anti-bacterial activity against Bacillus subtilis, Staphylococcus aureus, and Escherichia coli in the disc diffusion method.[33] In another study, the methanolic extracts of the leaves, seeds, fruits peel, and barks were tested against Escherichia coli, Klebsiellapneumonia, and Staphylococcusaureus. Pulp extract showed the highest zone of inhibition (ZOI) of 26 mm in Klebsiella pneumonia, while none of the other extracts showed significant ZOI. The aqueous extract of the pulp also showed highest anti-bacterial activity (ZOI of 27 mm) against Staphylococcusaureus.[34] The presence of naringenin and hesperidin might be responsible for its anti-bacterial activity. The anti-bacterial activity of hesperidin against Gram- positive and Gram-negative bacteria has already been established.[35] The essential oils from C. maxima also demonstrated anti-bacterial activity against Escherichia coli, Bacillus subtilis, Staphylococcusaureus, Pseudomonasaeruginosa, Bacilluslicheniformis, and Bacillusaltitudinis in the broth dilution methods.[36]

6.5 Anti-Alzheimer's Activity

Alzheimer's disease is a neurodegenerative progressive disease that occurs in the elderly population. During the experiments performed using Ellman's colorimetric and scopolamine- induced Alzheimer's methods, ethanolic, hexane, ethyl acetate, and aqueous extracts of C. maximafruit peel exhibited potent anti-Alzheimer's activity.[37-38] Similarly, it was found that the brain acetyl cholinesterase level was decreased by leaf extract and showed anti-Alzheimer's activity. The anti-Alzheimer's activity might be due to the development in the cognitive act and diminished oxidative stress by lowering malondialdehyde and nitrite levels. Also, it might be due to the renewal of superoxide dismutase, catalase, and glutathione S-transferase, and a reduction in glutathione as well as the acetylcholinesterase level in tested mice.[39]

6.6 Anti-obesity activity

The anti-obesity activity of ethanolic leaf extract (200 and 400 mg/kg) against olanzapine induced obesity and cafeteria diet-induced obesity in rats. Body weight, body temperature, and serum parameters were evaluated and found significantly decreased in their values as compared to the obese control group.[40] The C.maximaethanolic peel extract to the mice along with Chow diet for 8 weeks. The diet lowered the weight, decreased fasting blood glucose levels, and also reduced liver lipid and serum insulin levels.[41] Hesperidin also regulates the lipid and glucose metabolism and indirectly facilitates NF-κB signaling way to control inflammation which helps in controlling obesity.[42-43]

6.7 Antidepressant Activity

The aqueous leaf extracts (100, 200, and 300 mg/kg) of C. maxima were evaluated in mice for their anti-depressant potential using different models. Fluoxetine (20 mg/kg, i.p.) and imipramine (30 mg/kg, i.p.) were used as standard drugs. The aqueous leaf extracts reduced the immobility time in both the tail suspension test (TST) and the forced swimming test (FST). The exact mechanism for exhibiting antidepressants was not reported, but it might be due to enhancement of norepinephrine neurotransmission in mice.[44] Similarly, the per-oral administration of ethanolic extracts (200 and 400 mg/kg) of C.maxima in mice increased the number of rearing in both the TST and FST models while imipramine (1 mg/kg) noticeably reduced the immobility time.[45] Hesperidin and naringin were evaluated against anti-depressant activity using the FST and TST models. Both compounds exhibited significant anti-depressant activity.[46-47] The anti- depressant effects of plant extracts might be due to the interaction with the serotonergic 5-HT1A and κ-opioid receptors. It was concluded that C. maxima extract was useful in its motor- stimulating effects. Methanolic extract of Citrusmaxima fruit peel was studied in Open-field and Hole-cross experimental models using Swiss albino mice. The results obtained revealed that the extract had potent CNS depressant activity in a dose dependent manner.[48-49]

6.8 Hepatoprotective Activity

For the metabolism, separation, storage, and detoxification of both endogenous and exogenous chemicals, the liver is an essential component organ. Free radicals and oxidative stress increase the severity of liver damage, which can be lessened by the anti-oxidant system. Plant extracts are the best source of these anti-oxidants, which also have hepatoprotective properties. C. maxima (Pomelo) leaves were analyzed for their inherent hepatotoxic activity in rats against paracetamol- induced hepatotoxicity. Methanolic extract from leaves was prepared which was subsequently evaporated to procure crude extract. The paracetamol was administered for the liver damage among rats. For assessment of the hepatoprotective potential of prepared extract, silymarin was utilized as a standard drug for comparative study. C.maxima methanolic extract exerted a sound effect on thio barbituric acid reactive substances and reduced

glutathione levels along with catalase activities were reportedly restored to normal levels after administration of C. maxima plant extract. Histopathological investigations show that paracetamol administration causes hepatocellular vacuolization and localized hepatic necrosis in control mice, resulting in a substantial decrease in MECM 400 mg/kg and silymarin treated animals. C.maxima peels were shown to have a protective effect against CCl4-induced liver damage in a CCl4-induced hepatotoxicity model.[50-51]

7. CONCLUSION

From the above review we can be concluded that Citrusmaxima shows various health benefits. The fruits, flowers, leaves, essential oils and juices of citrus species are utilized to prepare various forms of food products. Along with their nutritional values, in the health industry, different parts of the plants of the citrus genus have been used as supplements or remedies to prevent or control diseases. This review focused on the pharmacological activities of Citrus medica, Citrus aurantium and Citrus maxima. The above mentioned citrus species produce secondary metabolites including flavonoids, alkaloids, limonoids, coumarins, carotenoids, phenolic acids and essential oils and their importance is due to their active properties. These characteristics include anti-oxidatant, anti-diabetic, anti-inflammatory, anti-microbial, anti-alzheimer, anti-obesity, anti-depressant as well as hepatoprotective activity. Besides of the above health benefits Citrus maxima juice gain less popularity due to presence of bitterness compound like naringin content. By reducing its bitterness marketability can be enhance so that anyone can get its health benefits.

REFERENCES

1. Abhilasha Shourie (2014) Ultrasonication assisted extraction of Phenolic antioxidants from Citrus maxima leaves and their GC-MS profile. International Journal of Pharma and Bio Sciences, 5(3): 38-48.
2. R. Susandarini, S. Subandiyah, Rugayah, B. S. Daryono, and L. H. Nugroho, "Assessment of taxonomic affinity of Indonesian pummelo (Citrus maxima (Burm.) Merr.) based on morphological characters," American Journal of Agricultural and Biological Science, 2013; 8.
3. R. Susandarini, S. Subandiyah, Rugayah, B. S. Daryono, and L. H. Nugroho, "Assessment of taxonomic affinity of Indonesian pummelo (Citrus maxima (Burm.) Merr.) based on morphological characters," American Journal of Agricultural and Biological Science, 2013; 8.
4. Hadjiakhoondi A, Baligh N. Practical guidance of medicinal plants. Islamic Azad University Scientific Publication Center, Tehran, 2005; 5-20.
5. Aswini Kharjul, Mangesh Kharjul et al. PHARMACOGNOSTIC INVESTIGATION ON LEAVES OF CITRUSMAXIMA (BURM.) MERR. (RUTACEAE). IJPSR, 2012; 3(12): 1000-1005.
6. Sawant T, Panhekar D. A Brief Review on Recent Advances of Citrusmaxima (Chakota). Int J Recent Sci Res, 2017; 8(8): 19400-16.
7. Morton JF. Fruits of Warm Climates: Pummelo. 1st ed. Miami (FL): Web publications, 1987; 147-51.
8. Liu, Y., Ren, C., Cao, Y., Wang, Y., Duan, W., Xie, L., Sun, C., & Li, X. (2017). Characterization and purification of bergamottin from Citrus grandis (L.) Osbeck cv. Yongjiazaoxiangyou and its antiproliferative activity and effect on glucose consumption in HepG2 cells. Molecules, 22(7): 1227.
9. Xu, C. J., Fraser, P. D., Wang, W. J., & Bramley, P. M. (2006). Differences in the carotenoid content of ordinary citrus and lycopene-accumulating mutants. Journal of Agricultural and Food Chemistry, 54(15): 5474-5481.
10. Tocmo, R., Pena-Fronteras, J., Calumba, K. F., Mendoza, M., & Johnson, J. J. (2020). Valorization of pomelo (Citrus grandis Osbeck) peel: A review of current utilization, phytochemistry, bioactivities, and mechanisms of action. Comprehensive reviews in food science and food safety, 19(4): 1969-2012.
11. Ali, M., Rumpa, N. E. N., Paul, S., Hossen, M., Tanvir, E. M., Hossan, T., Saha, M., Alam, N., Karim, N., Khalil, M.I., & Gan, S. H. (2019). Antioxidant potential, subacute toxicity, and beneficiary effects of methanolic extract of pomelo (Citrus grandis L. Osbeck) in long evan rats. Journal of toxicology, 2529569.
12. Shao, S. Y., Xu, W. J., Tao, J., Zhang, J. H., Zhou, X. R., Yuan, G., Yang, Y., Zhang, H. Y., Xu, Q., Deng, X. X., Hu, S. H., Zhang, M.X., Liu, Z. L & Yu, X. F. (2017). Glycemic index, glycemic load, and glycemic response to pomelo in patients with type 2 diabetes. Current Medical Science, 37(5): 711-718.
13. Tsai, H. L., Chang, S. K., & Chang, S. J. (2007). Antioxidant content and free radical scavenging ability of fresh red pummelo [Citrus grandis (L.) Osbeck] juice and freeze-dried products. Journal of agricultural and food chemistry, 55(8): 2867-2872.
14. He, J. Z., Shao, P., Liu, J. H., & Ru, Q. M. (2012). Supercritical carbon dioxide extraction of flavonoids from pomelo (Citrus grandis (L.) Osbeck) peel and their antioxidant activity. International journal of molecular sciences, 13(10): 13065-13078.
15. Abudayeh, Z. H., Al Khalifa, I. I., Mohammed, S. M., & Ahmad, A. A. (2019). Phytochemical content and antioxidant activities of pomelo peel extract. Pharmacognosy Research, 11(3): 244-247.
16. Shi, M., Liu, X., Zhang, H., He, Z., Yang, H., Chen, J., Feng, J., Yang, W., Jiang, Y., Yao, J. L., Deng, C. H., & Xu, J. (2020). The IAA-and ABA-responsive transcription factor CgMYB58 upregulates lignin biosynthesis and triggers juice sac granulation in pummelo. Horticulture research, 7: 139.
17. Thavanapong N, Wetwitayaklung P, Charoenteeraboon J. Comparison of Essential Oils Compositions of Citrus maxima Merr. Peel Obtained

by Cold Press and Vacuum Stream Distillation Methods and of Its Peel and Flower Extract Obtained by Supercritical Carbon Dioxide Extraction Method and Their Antimicrobial Activity. J Essent Oil Res, 2010; 22(1): 71- 7.
18. Nwanneka PA, Chiamaka HA. Nutrient, phytochemical, and antinutrient composition of Citrusmaxima fruit juice and peel extract. Food Sci Nutr, 2018; 6(3): 653-8.
19. Sidana J, Saini V, Dahiya S, Nain P, Bala S. A Review on Citrus - "The Boon of Nature". Int J Pharma Sci Rev Res, 2013; 18(2): 20-7.
20. Tocmo R, Pena-Fronteras J, Calumba KF, Mendoza M, Johnson JJ. Valorization of pomelo (Citrus grandis Osbeck) peel: A review of current utilization, phytochemistry, bioactivities, and mechanisms of action. Compr Rev Food Sci Food Saf, 2020; 19(4): 1-44.
21. Vijayalakshmi P, Radha R. An overview: Citrusmaxima. J Phytopharmacol, 2015; 4(5): 263-7.
22. Ahmad AA, Khalifa IIA, Abudayeh ZH. The Role of Pomelo Peel Extract for Experimentally Induced Wound in Diabetic Rats. Pharmacog J., 2018; 10(5): 885-91.
23. Nadakarni AK. Indian Material Medica. 3rd ed. Bombay: Popular Book Depot, 1954; p. 45-9.
24. Bhandurge P, Rajarajeshwari N, Alagawadi K, Agrawal S. Antidiabetic and hyperlipaemic effects of Citrus maxima linn fruits on alloxan-induced diabetic rats. Int J Drug Dev Res, 2010; 2(2): 273-8.
25. J. Yang, S.-Y. Lee, S.-K. Jang, K.-J. Kim, and M.-J. Park, Pharmaceutics, 2023; 15: 1595.
26. Shivananda, A., Muralidhara, R. D., Jayaveera, K. N. (2013). Anticancer Activity of Extracts of Various Fractions of Citrus maxima (J.Burm.) Merr. on HeLa Cell Line. Journal of Pharmacy and Chemistry, 7(1): 3-7.
27. KunduSen, S., Gupta, M., Mazumder, U. K., Haldar, P., Panda, S., & Bhattacharya, S. (2011). Exploration of anti-inflammatory potential of Citrus limetta Risso and Citrus maxima (J. Burm.) Merr. Pharmacologyonline, 7: 702-709.
28. M. Alamholo and M. Shojaemehr, Journal of Kermanshah University of Medical Sciences, 2020; 24(1).
29. Tsai, H. L., Chang, S. K., & Chang, S. J. (2007). Antioxidant content and free radical scavenging ability of fresh red pummelo [Citrus grandis (L.) Osbeck] juice and freeze-dried products. Journal of agricultural and food chemistry, 55(8): 2867-2872.
30. Abirami, A., Nagarani, G., & Siddhuraju, P. (2014). In vitro antioxidant, anti-diabetic, cholinesterase and tyrosinase inhibitory potential of fresh juice from Citrus hystrix and C. maxima fruits. Food Science and Human Wellness, 3(1): 16-25.
31. Dulay RMR, Castro MEGD, Antibacterial antioxidant activities of three citrus leaves extracts. Der Pharmacia Lettre, 2016; 8(13): 167–170.
32. S. Das, M. Borah, and S. Ahmed, "Antibacterial activity of the ethanolic extract of leaves of Citrus maxima (burm.) merr.on Escherichia coli and Pseudomonas aeruginosa," Asian Journal of Pharmaceutical and Clinical Research, 2013; 6: 136–139.
33. M. Sahlan, V. Damayanti, D. Tristantini, H. Hermansyah, A. Wijanarko, and Y. Olivia, "Antimicrobial activities of pomelo (Citrus maxima) seed and pulp ethanolic extract," AIP Conference Proceedings, 1933; 2018; 10–16.
34. [106] S. Yathiender, "A comparative study of antimicrobial activity of Citrus maxima and Citrus aurantium plant extracts," International Journal of Recent Scientific Research, 2017; 8(7): 18507–18509.
35. A. Corciova, C. Ciobanu, A. Poiata et al., "Antibacterial and antioxidant properties of hesperidin: β-cyclodextrin com-plexes obtained by different techniques," Journal of Inclusion Phenomena and Macrocyclic Chemistry, 81: 71–84.
36. Y. Chen, T. Li, J. Bai et al., "Chemical composition and antibacterial activity of the essential oil of Citrusmaxima (burm.) merr. Cv. shatian Yu," Journal of Biologically Active Products from Nature, 2018; 8(4): 228–233.
37. P. Vijayalakshmi and R. Radha, "In vitro anti-alzheimer and anti oxidant activity of the peels of Citrusmaxima fruits," Research Journal of Pharmacology and Pharmacodynamics, 2016; 8(1): 17.
38. A. Roohbakhsh, H. Parhiz, F. Soltani, R. Rezaee, and M. Iranshahi, "Neuropharmacological properties and phar-macokinetics of the citrus flavonoids hesperidin and hesperetin—a mini -review," Life Sciences, 2014; 113(1–2): 1–6, 2014.
39. A. Kumar, S. Dogra, and A. Prakash, "Protective effect of vnaringin, a citrus flavonoid, against colchicine-induced cognitive dysfunction and oxidative damage in rats," Journal of Medicinal Food, 2010; 13(4): 976–984.
40. S. S. Dinesh and K. Hegde, "Antiobesity activity of ethanolic extract of Citrus maxima leaves on cafeteria diet induced and drug induced obese rats," Research Journal of Pharmacy and Technology, 2016; 9(7): 907–912.
41. X. Ding, L. Guo, Y. Zhang et al., "Extracts of pomelo peels prevent high-fat diet-induced metabolic disorders in C57bl/6 mice through activating the PPARα and GLUT4 pathway,"PLoS One, 2013; 8(10): Article ID e77915, 2013.
42. H. Xiong, J. Wang, Q. Ran et al., "Hesperidin: a therapeutic agent for obesity," Drug Design, Development and Merapy, 2019; 13: 3855–3866.
43. S. Akiyama, S. I. Katsumata, K. Suzuki, Y. Ishimi, J. Wu, and M. Uehara, "Dietary hesperidin exerts hypoglycemic and hypolipidemic effects in streptozotocin-induced marginal type 1 diabetic rats," Journal of Clinical Biochemistry & Nutrition, 2010; 46: 87–92.
44. V. H. Potdar and S. J. Kibile, "Evaluation of antidepressant-like effect of Citrus maxima leaves in

animal models of depression," Iranian Journal of Basic Medical Sciences, 2011; 14(5): 478–483.
45. H. S. Sheik, N. Vedhaiyan, and S. Singaravel, "Evaluation of central nervous system activities of Citrusmaxima leaf ex-tract on rodents," Journal of Applied Pharmaceutical Science, 2014; 4(9): 77–82.
46. B. Ben-Azu, E. E. Nwoke, A. O. Aderibigbe et al., "Possible neuroprotective mechanisms of action involved in the neurobehavioral property of naringin in mice," Biomedicine & Pharmacotherapy, 2019; 109: 536–546.
47. S. Sohi and R. Shri, "Neuropharmacological potential of the genus Citrus," Review, 2018; 7(2): 1538–1548.
48. L. C. Souza, M. G. de Gomes, A. T. R. Goes et al., "Evidence for the involvement of the serotonergic 5-HT1A receptors in the antidepressant-like effect caused by hesperidin in mice," Progress in Neuro-Psychopharmacology and Biological Psy-chiatry, 2013; 40(1): 1, 103–109.
49. A.Roohbakhsh, H.Parhiz, F.Soltani, R.Rezaee, and M.Iranshahi, "Neuropharmacological properties and phar-macokinetics of the citrus flavonoids hesperidin and hesperetin—a mini -review," Life Sciences, 2014; 113(1–2): 1–6.
50. Zarina, Z., & Tan, S. Y. (2013). Determination of flavonoids in Citrus grandis (Pomelo) peels and their inhibition activity on lipid peroxidation in fish tissue. International Food Research Journal, 20(1): 313.
51. KunduSen, S., Gupta, M., Mazumder, U. K., Haldar, P., Panda, S., & Bhattacharya, S. (2011). Exploration of anti-inflammatory potential of Citrus limetta Risso and Citrus maxima (J. Burm.) Merr. Pharmacologyonline, 7: 702-709.