An Updated Review on Microscopical and Phytochemical Properties of *Momordica charantia* and *Duranta erecta*

Sumedh Nandeshwar[1], Yashwant Nakhate, Pranali Kalambe, Ashish Lande[3]
[1]*Department of Pharmacognosy, Dr. Arun Motghare College of Pharmacy, Kosra-kondha- 441908*
[2]*Assistant Professor, HOD of Pharmacognosy Department, Dr. Arun Motghare College of Pharmacy, Kondha-kosra, Maharastra*
[3]*Dr. Babasaheb Ambedkar Technological University, Loner, Raigad, Maharashtra*

Abstract: *Momordica charantia* is a plant of the Cucurbitaceae family is known as bitter melon, karela, and pare. It grows in tropical areas of the Amazon, Asia, South America India, East Africa and Caribbean, and is used traditionally as both food and medicine. The fruit ripens, the flesh (rind) becomes slightly tougher and bitterer, and many think it too repulsive to eat. *Momordica charantia* have provided many remedies for various diseases from ancient days to now a day. It has been used in various Asian traditional medicines for the treatment of cholera, anemia, diarrhea blood diseases, bronchitis, gout, dysentery, gonorrhea rheumatism, ulcer, colic, worms, disease of liver and spleen, cancer and diabetes etc. In preliminary phytochemical analysis we observed glycosides, phytosterols, alkaloids, phenolic, saponins compounds, fats, proteins, and fixed oils and flavonoids.

***Duranta erecta* (family: Verbenaceae) commonly referred to golden dewdrop, pigeon berry, angel whisper, or skyflower is one of the traditional medicinal plants. It has been shown to possess antimicrobial, antioxidant, and insecticide properties. Its phytoconstituents such as alkaloids, flavonoids, glycosides, phenolics, saponins, steroids, tannins, and terpenoids are reported as the basis of its efficacious therapeutic properties. The other important constituents which contribute to the remedial properties are durantol, pectolinaringenin, repennoside, repenins, and scutellarein. Published information on the phytochemical property of *D. erecta* was gathered by the use of different database platforms, including Google Scholar, ScienceDirect, PubMed, SciFinder, and Scopus, that provided an up-to-date review on its importance.**

Keywords: *Momordica charantia, Duranta erecta*, Microscopy, Phytochemical Analysis.

I.INTRODUCTION

1.1 *Momordica charantia:*

Momordica charantia is commonly known as Bitter melon, bitter guard and used as a food and natural medicine. The scientific name, Momordica means "to bite," in Latin which is refers to the jagged edges of the leaves. Including fruits, all parts of the plant, contains a bitter compound, momordicinso and very bitter in taste. The plant grows in tropical regions such as India, China, America Malaya, Bangladesh, tropical Africa, Thailand, Middle East[1]. Momordica charantia contains a different biologically active phytochemicals, which includes proteins, triterpens, saponins, flavonoids, steroids, alkaloids, and acids. The plant is beneficial for its anti-tumorous, anti-fungal, anti-parasitic, anti-cancer, antiviral, anti-fertility, anti-bacterial and hypoglycaemic properties due to the presence of numerous phytochemicals. In traditional medication, fruits and leaves are used to cure several diseases like: gout, rheumatism, colic, worms, illness of liver and spleen. Momordica contains alkaloids and peptides which resemble like insulin and charantin, a collection of steroidal sapogenins due to which it has hypoglycaemic property[2,3].

Fig. *Momordica charantia*

Diabetes mellitus is considered as one of the five leading causes of death in the world. Diabetes mellitus is a major global health concerning with a projected rise in prevalence from 171 million in 2000 to 366 million in 2030. It is a syndrome of disordered metabolism, usually due to a combination of hereditary and environmental causes, resulting in abnormally high blood sugar levels (hyperglycemia). Being a major degenerative disease, diabetes is found in all parts of the world and it is becoming the third most lethal disease of mankind and increasing rapidly. It is the most common endocrine disorder, affecting 16 million individuals in the United States and as many as 200 million individuals worldwide. Diabetes has been a clinical model for general medicine. Complementary and alternative medicine involves the use of herbs and other dietary supplements as alternatives to mainstream western medical treatment. A recent study has estimated that up to 30% of patients with diabetes mellitus use complementary and alternative medicine[4,5].

Medicinal plants and its products continue to be an important therapeutic aid for alleviating the ailments of human kind. Herbs for diabetes treatment are not new. Since ancient times, plants and plant extracts were used to combat diabetes. Many traditional medicines in use are derived from medicinal plants, minerals and organic matter. The World Health Organization (WHO) has listed 21 000 plants, which are used for medicinal purposes around the world. Among them, 150 species are used commercially on a fairly large scale.

Bitter melon comes in a variety of shapes and sizes. The typical Chinese phenotype is 20–30 cm long, oblong with bluntly tapering ends and pale green in color, with a gently undulating, warty surface[6,7]. The bitter melon more typical of India has a narrower shape with pointed ends, and a surface covered with jagged, triangular "teeth" and ridges. Coloration is green or white. Between these two extremes is any number of intermediate forms. Some bear miniature fruit of only 6–10 cm in length, which may be served individually as stuffed vegetables. These miniature fruit are popular in Southeast Asia as well as India. In Panama bitter melon is known as Balsamino. The pods are smaller and bright orange when ripe with very sweet red seeds[8].

Mormordica charantia (bitter gourd or bitter melon) is a climbing perennial that is characterized by elongated, warty fruit-like gourds or cucumbers and is native to the tropical belt. Although *Momordica charantia* is commonly used in traditional medical practices, along with research suggesting its benefits for people with type 2 diabetes, the current evidence does not warrant using the plant in treating this disease. This review of trials found only four studies which had an overall low quality[9,10].

1.2 *Duranta erecta*:

Duranta erecta (family: *Verbenaceae*) commonly referred to golden dewdrop, pigeon berry, angel whisper, or skyflower is one of the traditional medicinal plants. It has been shown to possess antimicrobial, antioxidant, and insecticide properties. Its phytoconstituents such as alkaloids, flavonoids, glycosides, phenolics, saponins, steroids, tannins, and terpenoids are reported as the basis of its efficacious therapeutic properties[11]. *Duranta erecta* is widely used in the traditional systems of medicines practiced in Bangladesh, India, Nigeria, the Philippines, and Brazil. The ethnomedicinal application as vermifuge, febrifuge, diuretic, anti-parasitic, and anti-malarial are well documented. *D. erecta* is also a significant source of phenylethanoid glycoside known as acteoside-a drug in clinical trials for IgA nephropathy patients[12].

Fig. *Duranta erecta*

The term nectar robbing is invoked when some floral visitors remove floral nectar by biting or piercing

holes in flowers, circumventing the floral opening used by legitimate floral visitors. Although nectar robbing is a common phenomenon in plant species with tubular flowers or flowers with nectar spurs, the potential effect of this illegitimate interaction on plant reproductive success has not yet received enough attention in the scientific literature. Recent evidence has shown that nectar robbing could have direct and indirect effects on plant fitness. For example, illegitimate visitors may decrease plant reproduction by directly damaging reproductive tissues or indirectly through changes in the behavior of legitimate pollinators. Although nectar robbers act in most cases as plant antagonists for plant reproduction, they could also benefit plant fitness under some circumstances. Consequently, changes in plant reproduction may occur in response to direct effects, to indirect effects, or to both. Long floral tubes have been traditionally interpreted as a floral adaptation for pollination by long-tongued or long-billed pollinators[13].

Several studies have shown that legitimate pollinators may select for long corollas. However, the negative impact of robbing on plant fitness may translate into a selective force that counter balances the selection for longer corollas imposed by specialist pollinators. Unfortunately, the relationship between flower morphology and the odds a flower will be robbed has been overlooked in the literature and, consequently, the role of nectar robbers as selective agents on flower morphology has not been evaluated in natural populations. The present study aimed to evaluate the functional relationship between flower morphology and nectar robbing and examine the reproductive consequences of the interaction in a population of *Duranta erecta* (Verbenaceae) on the island of Cuba. Accordingly, we analysed the frequency of nectar robbing, as well as the effect of nectar robbing on individual and plant female fitness. We also estimated the probability of a flower being robbed as a function of flower morphology[14].

2. MATERIALS AND METHODS

2.1. Collection of Plants:

The herbal plants were collected from the local nursery of Pauni and the plants were dried for the preparation of the herbarium sheet. The Plants were authenticated by the by Dr. Nitin Dongarwar, Head of Department of Botany, R.T.M Nagpur University, Nagpur.

2.3Microscopy

The Fresh leaf and steam were used for the microscopically evaluation. Fine sections mounted on glass slide with help of glycerin without any staining reagent used were placed under microscope. Staining of the fine sections with methyl orange and phloroglucinol was done. Various identifying characters, such as type of trichomes and cell composition were recorded. The leaves and the steam were observed under the microscope. The section watched under the 10X & 45Xmagnification.The staining reagent (Phloroglucinol-HCl and methyl orange) were used as per the standards procedures[15,16].

2.4. Preliminary Phytochemical Investigation

The plant material were extracted in different solvents and tested for various phytoconstituents present in them by standard procedures.

2.4.1 Test for alkaloids

The small portion extracts were stored separately with a few drops of dilute hydrochloric acid and filtered. The filtrate was tested with various alkaloidal agents, such as Mayer's reagent (cream precipitate) and Dragendorffs reagent (orange brown precipitate) [17,18].

2.4.2 Test for carbohydrates and glycosides

Small quantity of extracts were dissolved separately in 5mL of distilled water and filtered. The filtrate was subjected to Molisch's test to detect the carbohydrates[19]. Another small portion of extract was hydrolyzed with dilute hydrochloric acid for few hours in a water bath and was subjected to Liebermann-Burchard's, legaland Borntrager's test to detect different glycosides. (Pink to red color indicates presence of glycosides) [20].

2.4.3 Test for flavonoids

5 mL of dilute ammonia solution were added to a portion of aqueous filtrate of plant extract followed by addition of concentrated H_2SO_4. A yellow coloration observed in extract indicated presence of flavonoids. Test for steroids 2mL acetic anhydride was added to 0.5g extracts with 2 mL H_2SO_4. The color changed from violet to blue or green in samples indicated presence of steroid[21].

2.4.4 Test for terpenoids (Salkowskitest)
Five mL of extracts were mixed in 2 mL of chloroform, and then concentrated H_2SO_4 (3 mL), was carefully added to form a layer. A reddish brown coloration formed at the interface indicated presence of terpenoids[22,23].

2.4.5 Test for saponin
About 1 mL of extract were diluted with distilled water to20 mL and shaken in graduated cylinder for 15 minutes. One cm layer of foam indicated presence of saponin[24].

2.4.6 Test for tannin
When extract were treated with vanillin-hydrochloric acid reagent, pink or red color was formed due to formation of phloroglucinol[25].

2.4.7 Test for protein
Mellon's reaction: Million's reagent (mercuric nitrate in nitric acid containing a trace of nitrous acid) usually yields a white precipitate on addition to a protein solution, which turns red on heating[26].

2.4.8 Test for volatile oil or essential oil
A thick section of extract was placed on a glass slide. A drop of Sudan red reagent was added and after two minutes, it was washed with50% alcohol mountain glycerin[27].

2.3 Extraction
Each dried plant part of 10 gm was ground and extracted by simple maceration method, with a particular solvent of 100ml for 48 hours in a continuous shaking at room temperature[28]. The extract was filtered and then it was dried by using a rotary evaporator under vacuum at a temperature of 45°C

3. RESULT

The herbal plants were collected from the local nursery of pauni and authenticated by the by Dr. Nitin Dongarwar, Head of Department of Botany, R.T.M Nagpur University, Nagpur.

3.1 Microscopically Evaluation:
3.1.1: Microscopy of *Momordica charantia*:

Fig. a: Vessels, Vascular bundle

Fig.b: Phloem, Xylem

3.1.2: Microscopy of *Durenta erecta*:

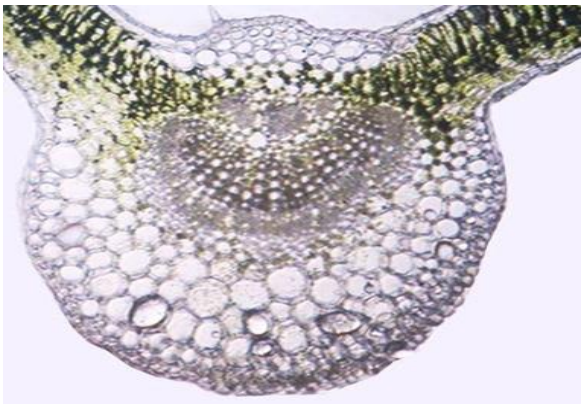

Fig. a: Entire leaf portion

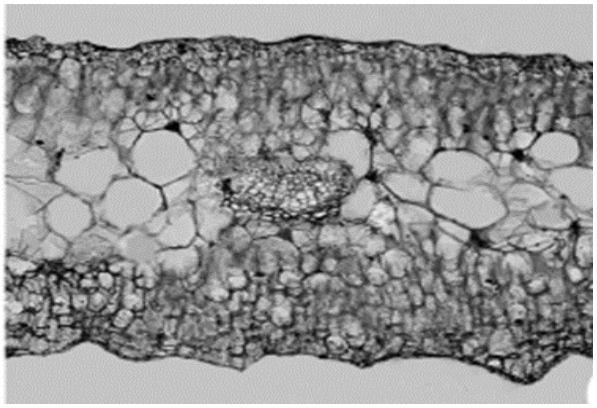

Fig. b: Colenchyma, Cortex.

Fig.3.1.2:T.S of *Durenta erecta*

3.2 Preliminary Phytochemical Screening :

The plant material were extracted in different solvents and tested for various phytoconstituents present in them by standard procedures. The Preliminary Phytochemical analysis showed that the plants contain :

Test for active constituents	*Momordica charantia*	*Duranta erecta*
Alkaloids	+ve	+ve
Carbohydrates	+ve	+ve
Reducing sugars	-ve	-ve
Steroids	-ve	+ve
Glycosides	+ve	-ve
Flavonoids	+ve	+ve
Terpenoid	+ve	+ve
Saponin	+ve	+ve
Proteins	+ve	-ve
Tannins	+ve	+ve
Aminoacids	+ve	-ve
Volatile oil or Essential oil	-ve	-ve

Table: Preliminary Phytochemical analysis of *Momordica charantia* and *Durentaerecta*

4. CONCLUSION

The present study discuss the need and emphasizes the importance of the pharmacognostic study of the medicinal plants i.e. *Momordica indica* and *Duranta erecta*. The herbal plants were collected from the local nursery of Bhandara and the plant were dried for the preparation of the herbarium sheet. The Plants were authenticated by the by Dr. Nitin Dongarwar, Head of Department of Botany, R.T.M Nagpur University, Nagpur. Morphological and the various pharmacognostic aspects of different parts of the plant were studied. The phytochemical analysis showed that the *Momordica indica* plant extract contains a mixture of phytochemicals as alkaloids, reducing sugars, flavonoids, saponin and the volatile oil and the *Durantaerecta* extract contains the phytochemicals like alkaloids, carbohydrates, reducing sugars, flavonoids, triterpenes, saponin and tannins.

REFERENCE

[1] Chekka S. V., Kumar N. Mantipelly Department of Pharmacology, Jawaharlal Nehru Technological University-Kakinada (JNTUK), India. Pg No. 12-15

[2] Inouye D.W. 1980. The terminology of floral larceny. Ecology 61: 1251–1253.

[3] Inouye D.W. 1983. The ecology of nectar robbing. In: Bentley B, Elias TS, eds. The biology of nectaries. New York, NY: Columbia University Press, 153–174.

[4] Maloof J.E. 2001. The effects of a bumble bee nectar robber on plant reproductive success and pollinator behavior. American Journal of Botany 88: 1960–1965.

[5] Maloof J.E., Inouye D.W., 2000. Are nectar robbers cheaters or mutualists. Ecology 81: 2651–2661.
[6] R. Singh, R. Dhiman & P. Mittal; Mosquito larvicidal properties of *Momordica charantia* Linn (Family: Cucurbitaceae) J Vect Borne Dis 43, 2006, pp. 88–91.
[7] C. Umesh, S. Yadav, 2005. International Journal of Pharmaceutical Sciences Review and Research, Volume 1, 111-112.
[8] J. Lal, S. Chandra, V. Raviprakash , M. Sabir 1976, Indian Journal of Physiology and Pharmacology , 64.
[9] S. Sivakamia, S. Shahanib, A. C. Sutharc, M. M. Banavalikar, M. K. Biyanic, 2003 "Antihyperglycemic effects of three extracts from *Momordica charantia*". 107–11.
[10] M. Lotlikar, and R. Rajarama ,1996, Pharmacology of a hypoglycaemic principle isolated from the fruits of Momordica charantia Linn. Indian J Pharm, 129.
[11] Bakare R. I. 2010. Department of Biochemistry, College of Medicine, University of Lagos. Idi-Araba, Lagos State, Nigeria. 2192.
[12] Kumar S. D. 2010. A Medicinal Potency of Momordica Charantia, Nalanda College of Pharmacy, Nalgonda, Andhra Pradesh. Volume 1. 95-96.
[13] Leatherdale B. A. 1981. Improvement in glucose tolerance due to Momordica charantia (karela). 282.
[14] Subsongsang R. 2016. Phytochemical Properties of "Golden Dewdrop" *Durantaerecta.*115-117.
[15] Donkor S. 2019. Biochemistry research international, Volume-1. 2214-2215.
[16] S. Sousa,A. Reis ,PC Silva , Viccini LF. 2010. An increment in the *Duranta repens* L. (*Verbenaceae*) knowledge: DNA content, karyology, meiosis and palynology. *Caryologia*:110–6.
[17] S. Hiradate, H. Yada,T. Ishii ,N. Nakajima , Ohnishi-Kameyama M,1999. Three plant growth inhibiting saponins from *Durantaerecta*. Phytochemistry.1223-1225.
[18] H. Singh, F. Zameer, S. Khanum, R. Garampalli . *Duranta* – A phytosterol antifungal contributor from *Durantaerecta* Linn. for organic Management of Sorghum Downy Mildew. 145-146.
[19] A. Marwal, A. Sahu, R. Prajapat and R. Gaur .2012. Indian Journal of Physiology and Pharmacology, *Datura erecta*. Indian. J. Virol. 384.
[20] J. Lal, S. Chandra,V. Raviprakash , J. Sabir, 1976. Indian Journal of Physiology and Pharmacology, 64.
[21] Gupta AK, Tandan N, Sharma N. Quality Standards of Indian Medicinal Plants, ICMR. 2005, 3:262-270.
[22] Indian Medicinal Plants. A Compendium of 500 species, Orient Longman Ltd., Madras 1995; 4: 48-51.
[23] Nadkarni KM. Indian Materia Medica. Vol 1, Popular Prakashan .1993; 805-806.
[24] Agharkar SP. Medicinal plants of Bombay Presidency. Scientific Publishers, Jodhpur. 1953.
[25] Garau C, Cummings E, Phoenix DA and Singh J. Beneficial effect and mechanism of action of Momordica charantia in the treatment of diabetes mellitus a mini review. Int J Diab Metabol. 2003;11: 46-55.
[26] Kumar DS, Sharathnath KV, Yogeswaran P, Harani A, Sudhakar K, Sudha P and Banji D. A medicinal potency of Momordica charantia. Int J Pharmaceu Sci Rev Res. 2010;1(2): 95
[27] Jagessar RC, Mohamed A and Gomes G: An evaluation of the antibacterial and antifungal activity of leaf extracts of Momordica Charantia against Candida albicans, Staphylococcus aureus and Escherichia coli. Nat Sci. 2008; 6(1).
[28] Jadhav D. Medicinal plants of Madhya Pradesh and Chhattisgarh 2008, 213-214.
[29] hahatAA, NazifNM, AbousettaLM, IbrahimNA, Cos P, Van MiertS, etal. Phytochemical investigation and antioxidant activity of Du