

## A REVIEW ON CUCUMIS OPERCULATUS: A POTENTIAL MEDICINAL PLANT

Mukund Kumar Yadav<sup>1\*</sup> and Prashant Singh<sup>2</sup>

<sup>1</sup>M. Pharm (Pharmacology), SHEAT College of Pharmacy,

<sup>2</sup>Assistant Professor, SHEAT College of Pharmacy,

Department of Pharmacology, Sarswati Higher Education & Technical College of Pharmacy,

Dr. A. P. J. Abdul Kalam Technical University, Lucknow, Uttar Pradesh, India, 226031.

Article Received on  
13 May 2022,

Revised on 03 June 2022,  
Accepted on 23 June 2022

DOI: 10.20959/wjpr20229-24731

### \*Corresponding Author

**Mukund Kumar Yadav**

M. Pharm (Pharmacology),  
SHEAT College of  
Pharmacy, Department of  
Pharmacology, Sarswati  
Higher Education &  
Technical College of  
Pharmacy, Dr. A. P. J.  
Abdul Kalam Technical  
University, Lucknow, Uttar  
Pradesh, India, 226031.

### ABSTRACT

*Cucumis operculatus* (Common name- Turiya, Family- Cucurbitaceae) is a famous edible fruit in India and other Asian countries. It consists of a good quantity of vitamins, minerals, fiber, carotene, calcium, vitamin B2, vitamin C, niacin, phosphorous, and a small amount of iodine and fluorine and *Cucumis operculatus* is a healthy food. Various pharmacological activities proved that, *Cucumis operculatus* contains hypoglycaemic, antimicrobial, gastroprotective, immunomodulatory, anti-inflammatory and analgesic, CNS, anti-parasitic, toxicity, abortifacient activities. The recent review discussed about the description of *Cucumis operculatus* and its pharmacological activities.

**KEYWORDS:** *Cucumis operculatus*, Cucurbitaceae, Pharmacological activity, Anti-inflammatory, Immunomodulatory, CNS, Anti-microbial, Analgesic.

### INTRODUCTION

*Cucumis operculatus* is economically established for its fresh natural goods as a vegetable. The regular cleaning wipes are the organic goods which are developed from the *Cucumis operculatus* and used. It is broadly spreaded from southeastern Asia to focal and eastern Asia. In areas, with lower temperature, environments, it is grown as a house plant. The normal English names of the *Cucumis operculatus* are, Chinese Okra, furrowed gourd, vegetables gourd, velvety gourd, luffa, dish material gourd, wipe gourd, sifter plant, silk gourd, sinkwa towel sponge, ribbed loofah.<sup>[1]</sup>



Fig. 1: Fruit of *cucumis operculatus*.<sup>[2]</sup>



Fig. 2: Flower of *cucumis operculatus*.<sup>[3]</sup>



Fig. 3: Climber of *cucumis operculatus*.<sup>[4]</sup>



Fig. 4: Seeds of *cucumis operculatus*.<sup>[5]</sup>

### Botanical description

#### Roots

The colours of roots are yellowish- brown, and the shape of *Cucumis operculatus* roots are cylindrical. The *Cucumis operculatus* are rough in texture due to its longitudinal wrinkles and it also contains some adventitious roots.

#### Stem

The colour of stems are brownish-yellow, the thickness is 0.2-0.4 cm, It contains 5 angles, glabrous, and it contains 3-fid tendrils (tendrils).

#### Petiole

The colour of petiole is brownish-yellow, length is 3-8 cm, petioles are somewhat twisted, they are wrinkled, orbicular, the colour of angular lamina is pale or light green, the angular lamina is broad and crimped.

#### Flowers

The flowers are gynocious, having yellow and showy in long pedicel contains female flower, rarely in clusters, they are having long ovary, and the stigma are slightly ribbed. The colour of male flower is light greenish-yellow, arises in few racemes having lanceolate lobes and pubescent calyx. The colour of corolla is yellow and total three stamens are present, whereas the colour of female solitary flower is yellow and it consists of long pedicel. It contains stigma tri-fid and strongly ribbed ovary.

#### Fruits

The shape of fruit is obovate, club shaped or cylindrical. The colour of fruit is pale yellowish

brown, the fruit is covered with 8-10 prominent longitudinal ribs on the outer surface of fruits and they are tapering towards the base. The fruit contains three compartment, the inner compartment is fibrous and it can be easily removable from the outer compartment.

### Seeds

The colour of seeds are black, the taste of seed is bitter and the shape of *Cucumis operculatus* is ovoid and oblong.<sup>[6,7]</sup>

a) **Botanical classification- Kingdom:** Plantae **Subkingdom:** Viridiplantae **Infrakingdom:** Streptophyta **Superdivision:** Embryophyta **Division:** Tracheophyta **Subdivision:** Spermatophytina **Class:** Magnoliopsida **Superorder:** Rosanae **Order:** Cucurbitales **Family:** Cucurbitaceae **Genus:** *Luffa*, **Species:** *Luffa acutangula*.<sup>[8]</sup>

b) **Botanical name -** *Cucumis operculatus*

c) **Common names -** India: jhinga tor, Chinese: guang dong si gua; English: angled loofa, angled loofah, Chinese okra, Portugese: Bucha de purge, Chinese squash, dishcloth gourd, ribbed loofah, ridged gourd, silk gourd, silk squash, sinkwa towelsponge, strainer vine, Russian: ljufa; Vietnam: muop khia vegetable gourd; French: papangaye; Philippines: patola; Japanese: tokado-hechima German: gerippte Schwammgurke; Arabic: leaf; kalitori, turiya; Malaysia: ketola, petola segi; Lufa riscada; Spanish: esponja, esponja estropajo, muñeco, servilleta de pobre.<sup>[9,10]</sup>

d) **Synonyms -** *Cucumis acutangulus*, *Cucumis longus var. indicus*, *Cucumis lineatus*, *Cucurbita acutangula*, *Luffa acutangula var. amara*, *Luffa amara*, *Luffa acutangula var. forskalii*, *Luffa drastic*, *Luffa fluminensis*, *Luffa foetida*, *Cucumis megacarpus*, *Luffa forskalii*, *Luffa gosa* and *Momordica tubiflora*, *Luffa acutangula*.<sup>[11]</sup>

e) **Occurrence-** *Luffa acutangula* is native to Indian subcontinent (India and Pakistan) and naturalized throughout tropics and subtropics. It was found in-

- **Africa:** (Chad, Kenya, Benin, Ghana, Mauritius, Madagascar, Uganda, Nigeria, Mozambique, Sierra Leone,)
- **Asia:** (India, Bangladesh, China, Kazakhstan, Philippines, Vietnam, Hong Kong, Japan, Malaysia, Myanmar, Taiwan, Yemen, Pakistan, Thailand, Sri Lanka,)
- **Central America and Caribbean:** (Cuba, El Salvador, Tobago Costa Rica, Trinidad ,

Puerto Rico, Dominican Republic, Jamaica, Martinique,)

- **North america:** (Mexico, USA) and Australia
- **South america:** (Venezuela, Ecuador, Peru, Brazil.<sup>[9,10]</sup>

### **Cucurbiteaceae family**

The largest family of fruit crops and vegetables, which consist of approximately 125 genera and 960 species, and is known as Cucurbitaceae. The fruit, crops and vegetables of the family Cucurbitaceae are the members of comestible traditions and family is written in folk medicine and Ayurveda in India for their therapeutic effect. For the production of effective and safe therapeutics products, may be considered as a potential source of therapeutics.<sup>[12]</sup>

There are two sub-families of Cucurbitaceae, are as follows-

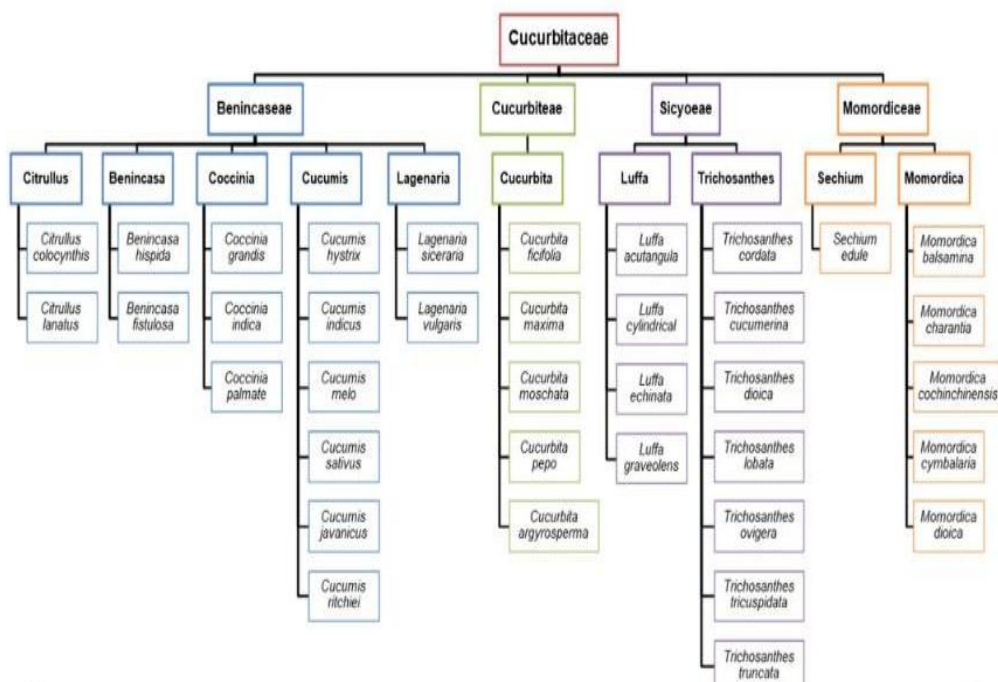
- Cucurbitoidae
- Zanonivideae

And this, Classification is based on the their proportion such as, cytological, morphological, and floral. In the subfamily, Cucurbitoidae, it consist of most of fruit varieties, and they can be categorized into 15 tribes and related genera. If we mention specifically, so there are four tribes of family Cucurbitaceae, which are:-

- Benincaseae
- Momordiceae
- Cucurbiteae
- Sicyoeae

These tribe only grow the edible food items from these plants in subcontinents of India.<sup>[13]</sup> The Affordable valuable edibles are grow by the members of tribe, Cucurbetae such as gourds (*cucurbita spp*), squashes (*cucurbita spp*) melons (*cucumis melo*), and luffas (*luffa spp*). The Cucurbitaceae family food plants, detailed list of various tribal classification and genera are mention below the figure 5:-





**Fig. 5: Difference tribal classification and genera of the cucurbeatecae family food plant.**<sup>[14]</sup>

### Pharmacological effects of *cucumis operculatus*

The *Cucumis operculatus* plant having various purified compounds and extracts and they are studied for different- different pharmacological effects by various researchers by using in vivo and in vitro models. The different parts of the plant shows various effects such as, immunomodulatory, hypoglycaemic, antimicrobial, gastroprotective, anti-inflammatory and analgesic, antiparasitic, toxicity effects.<sup>[15]</sup>

#### a) Hypoglycemic effect

The *Cucumis operculatus* methanolic fruit extract were characterized by oral glucose tolerance test in glucose-loaded mice, and its shows the antihyperglycemic effect. The blood sugar concentration were decreased because of fruit significance and dose dependency of methanolic extract (38.5, 39.6, and 41.8% deduction at 200, 200, and 400mg/kg body weight. When a lower dose of extract, 50 mg per kilogram body weight was given, due to this extract the blood sugar concentration is reduced by 13.1%, but it dose not produced the statistical significant effect.<sup>[16]</sup> In this study, streptozotocin produce diabetes in rats, the ethanolic extract of *Cucumis operculatus* fruits and seeds produces the antidiabetic effects, the fasting blood sugar of streptozotocin diabetic rat were decreased in dose related manner by using the extract (200 and 400 mg/kg) significantly ( $p < 0.05$ ), due to which, after 21 days, the

maximum hypohlycemic effect were produced.<sup>[17]</sup>

In mice, the methanolic leaves extract of *Cucumis operculatus* were produced the hypoglycemic effect. When by using an oral glucose tolerance test, the glucose were load in mice, after the 15 minutes of glucose loading, *Cucumis operculatus* extract produced the bebeficial hypoglycemic effect. When, there is a comparison made between extract of there plants, such as *Kyllinga monocephala*, *Bixa orellana* and *Cucumis operculatus*, the *Cucumis operculatus* is the bestexample among there, that shows most potent glucose level reducing activity (37.5%) in comparison of glibenclamide (37.88%).<sup>[18]</sup> In the alloxan produced diabetic Wister rats, the hypoglycemic effect produced by the chloroform, petroleum ether and ethanol extracts of fruits of *Cucumis operculatus* were characterized. In comparison of Glibenclamide (10mg/kg body weight), the alcoholic and chloroform extract of fruits of *Cucumis operculatus* shows more efficient effect of deduction in blood glucose level.<sup>[19]</sup> The studies in which, streptozotocin (65 mg/kg, ip) and Nicotinamide (120mg/kg,IP) produce non-insulin dependent diabetes mellitus in rats, and the antidiabetic and antihyperlipidemic properties of methanolic and aqueous extracts of *Cucumis operculatus* fruits were studied.<sup>[20]</sup>

#### **b) Antimicrobial effects**

Against the *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Escherichia coli* and *Candida albicans*, the study were perform by using ethanolic extract of *Cucumis operculatus* to produce by using ethanolic extract of *Cucumis operculatus* to produce antibacterial activity against the tested bacteria and fungi, the inhibitory zones were seemed of 10, 9, 8 and 8 mm respectively. By performing in vitro well diffusion assay, the *Escherichia coli*, *Klebsiella pneumonia*, *Staphylococcus aureus*, *Proteus vulgaris*, *Aspergillus niger* *Candida albicans* and *Fusarium sp*, were tested against the aqueous and ethanolic extract of various *Cucumis operculatus*, commonly known as *Luffa acutangula amara*, parts (fruits, roots, seeds and leaves) produces the antimicrobialeffect. At different different beneficial levels, the different parts of *Cucumis operculatus* methanolic and aqueous extracts produces antimicrobial effect. Against *Klebsilla pneumonia*, the methanolic extracts of leaves and fruits also produces the antimicrobial effects. The highest zone of inhibition recorded against *Streptococcus pyrogens* (20.0±0.35 mm), for the alcoholic extracts of *Cucumis operculatus*.<sup>[21]</sup>

#### **c) Gastroprotective effect**

The Aspirin induce gastric ulcerations were deliberated in Streptozotocin produced diabetic

rats were studied against methanolic and aqueous extracts (100, 200 and 400 mg/kg once daily for 21 days) of *Cucumis operculatus*. The musosal glycoprotein and antioxidant enzymes level in gastric mucosa of diabetic rats, were increased by using methanolic extract significantly ( $p < 0.01$ ) in comparison of aqueous extract ( $p < 0.05$ ). The delay in healing of gastric ulcer in diabetic rats close to normal range, were effectively reversed by methanolic extract were better in healing ulcer, in comparison of glibenclamide and aqueous extract due to its mucosal protective actions and antihyperglycemic effects.<sup>[22]</sup>

#### **d) Immunomodulatory effect**

By performing the in vivo phagocytosis using neutrophil adhesion test and carbon clearance test, the immune modulatory effects were characterized by using ethanol extract of *Cucumis operculatus* (*Luffa acutangula* var *amara*). The potent in vitro antioxidant activity, increased percentage of neutrophil adhesion ( $24.63 \pm 0.87\%$ ) and increased phagocytic index ( $0.028 \pm 0.002$ ), were observed from ethanolic extracts.<sup>[23]</sup>

#### **e) Anti-inflammatory and analgesic effects**

The Carrageenan induced hind paw edema and cotton pellet granuloma models in rats were evaluated by using ethanol and ethyle acetate extracts (250 mg and 500 mg/kg) of leaves (dried) of *Cucumis operculatus* to produce the anti-inflammatory activity both, in acute and chronic models. The beneficial anti-inflammatory effects were produced by both extracts, that is, ethyl acetate and ethanol extracts.<sup>[24]</sup> By inducing carrageenan induced paw edema rats, the anti-inflammatory activity were evaluated by using ethanolic extract (500 mg/kg) of the fruits of *Cucumis operculatus*. The ethanolic fruit extract of *Cucumis operculatus* produces beneficial ( $p < 0.05$ ) inhibition of paw volume that is 72.73%.<sup>[25]</sup> By using tail flick and tail immersion methods the analgesic activity were studied in carrageenan induced rat paw edema method and anti-inflammatory were evaluated by using ethanolic extract of seed of *Cucumis operculatus*. The extract were produced the beneficial analgesic effect and anti-inflammatory effect, by using tail flick and tail immersion method, the reaction time noted were  $6.25 \pm 0.52$  seconds, at a dose of 400 mg/kg.<sup>[26,27]</sup>

#### **f) Antiparasitic effect**

The late third larval age group of *Culex quinquefasciatus*, the extract of *Cucumis operculatus* were produced the larvicidal activity. After the exposure, of 24 hours the larval mortality were observed. 839.81 ppm were the LC 50 values of the extract of *Cucumis operculatus*.<sup>[28]</sup> By performing in vitro test by using earth worm, *Pheretima posthuma* test, the anthelmintic



effect of extract aerial parts of *Cucumis operculatus*. By using methanolic aerial part extract of *Cucumis operculatus* produced the average anthelmintic properties. By using 10mg/ml of concentration, it produces paralysis and after more than 90 minutes, it causes death.<sup>[29]</sup>

### g) Toxicity

When oral dose of upto 2gm/kg were given to rats, the ethanolic extract of leaves were produced zero toxicity. There is no mortality were caused in mice upto 10gm/kg dose, even after 72 hours, by performing acute toxicity and lethality test of the ethanolic fruits and seeds extracts of *Cucumis operculatus* in rats gave an oral LD50 more than 5gm/kg hydroalcoholic fruit extract (70%) of *Cucumis operculatus*.<sup>[30]</sup>

## CONCLUSION

We had concluded from the recent review, that the pharmacological activity of *Cucumis operculatus* included hypoglycemic antimicrobial, antiparasitic, gastroprotective, anti-inflammatory and analgesic, immunomodulatory, and other effects. The review article conclude that, the *Cucumis operculatus* provides safety, and act as a promising medicinal plant for therapeutic purposes as a report of efficacy and safety.

## Acknowledgement

The corresponding author is grateful to the college authorities of SHEAT College of Pharmacy, for their constant support through out this work.

## REFERENCES

1. J.Anitha and S. Miruthula; Traditional Medicinal Uses, Phytochemical Profile And Pharmacological Activities Of *Luffa acutangula* Linn; IJP, 2014; 1(3): 174 – 183. [https://en.wikipedia.org/wiki/Luffa\\_acutangula](https://en.wikipedia.org/wiki/Luffa_acutangula)
2. [https://www.google.com/search?q=Luffa+acutangula+fruits&tbm=isch&ved=2ahUKEwidw8\\_s1q\\_4AhUL1XMBHaMXDnMQ2](https://www.google.com/search?q=Luffa+acutangula+fruits&tbm=isch&ved=2ahUKEwidw8_s1q_4AhUL1XMBHaMXDnMQ2)
3. <https://www.pinterest.com/pin/514817801135789351/>
4. <https://www.flickr.com/photos/shanfari/6098945848>
5. <https://www.google.com/search?q=Luffa+acutangula++images&client=firefox-b>
6. Mishra B., Mukerjee A. In vivo and ex vivo evaluation of *Luffa acutangula* fruit extract and its fractions for hepatoprotective activity in wistar rats. Int. J. Pharm. Sci. Res, 2017; 8: 5227–5233.
7. Ulaganathan I., Divya D., Radha K., Vijayakumar T., Dhanaraju M. Protective effect of

- Luffa acutangula (var) amara against carbon tetrachloride-induced hepatotoxicity in experimental rats. *Res. J. Biol. Sci.*, 2010; 5: 615–624. [10.3923/rjbsci.2010.615.624](https://doi.org/10.3923/rjbsci.2010.615.624)
8. Invasive Species Compendium, Luffa acutangula, <https://www.cabi.org/isc/datasheet/31692>
  9. U.S. National Plant Germplasm System, Luffa acutangula, <https://npgsweb.arsgrin.gov/gringlobal/taxonomydetail.aspx?id=22787>
  10. The plant list, Luffa acutangula. <http://www.theplantlist.org/tpl/record/kew-2338862>
  11. Ali Esmail Al-Snafi, A review on Luffa acutangula: A potential medicinal plant, *IOSR Journal Of Pharmacy*, 2019; 16. (e)-ISSN: 2250-3013, (p)-ISSN: 2319-4219 Volume 9, Issue 9 Series.
  12. Mukherjee, P.K., Ethnopharmacology and ethnomedicine-inspired drug development. In: Mukherjee, P.K. (Ed.), *Quality Control and Evaluation of Herbal Drugs*. Elsevier, 2019; 29–51. <https://doi.org/10.1016/B978-0-12-813374-3.00002-8>.
  13. Renner, S.S., Pandey, A.K., The Cucurbitaceae of India: accepted names, synonyms, geographic distribution, and information on images and DNA sequences. *PhytoKeys*, 2013; 20: 53–118.
  14. Pulok K. Mukherjee a, b,\*, Seha Singha b, Amit Kar a, Joydeb Chanda a, Subhadip Banerjee b, Barun Dasgupta b, Pallab K. Haldar b, Nanaocha Sharma, Therapeutic importance of Cucurbitaceae: A medicinally important family, *Journal of Ethnopharmacology*, 2 September 2021, *Journal of Ethnopharmacology*, 2022; 282: 114599.
  15. Preetha S Panicker, Pharmacological review of Luffa acutangula (L) Roxb, *Journal of Pharmacognosy and Phytochemistry*, Accepted, 2020; 13: 10. E- ISSN: 2278-4136 P-ISSN: 2349-8234
  16. Juma A, Pervin R, Al Azad S, Islam R, Rahman M, Kabir Z, Taznin I, Bashar A and Rahmatullah M. Antihyperglycemic and antinociceptive activity of methanolic extract of Luffa acutangula fruits. *Advances in Natural and Applied Sciences*, 2013; 7(5): 435-441.
  17. Raj SM, Mohammed S, Vinoth KS, Santhosh KC and Subal D. Antidiabetic Effect of Luffa acutangula fruits and histology of organs in streptozotocin induced diabetic in rats. *Research J Pharmacognosy and Phytochemistry*, 2012; 4(2): 64-69.
  18. Quanico JP, Amor EC and Perez GG. Analgesic and hypoglycemic activities of Bixa orellana, Kyllinga monocephala and Luffa acutangula. *Philippine Journal of Science*, 2008; 137(1): 69-76.
  19. Patil PS, Patel MM and Bhavsar CJ. Comparative antidiabetic activity of some herbal

- plant extracts. *Pharma Science Monitor*, 2010; 1(1): 12-19.
20. Pimple BP, Kadam PV and Patil MJ. Antidiabetic and antihyperlipidemic activity of *Luffa acutangula* fruit extracts in streptozotocin induced NIDDM rats. *Asian J Pharm Clin Res*, 2011; 4(2): 156-163.
  21. Jaysingrao J and Sunil CN. Evaluation of antimicrobial activity of *Luffa acutangula* (L.) Roxb. var. amara (Roxb.) Clarke. *International Journal of Advanced Research*, 2013; 1(10): 323-326.
  22. Pimple BP, Kadam PV and Patil MJ. Protective effect of *Luffa acutangula* extracts on gastric ulceration in NIDDM rats: role of gastric mucosal glycoproteins and antioxidants. *Asian Pac J Trop Med*, 2012; 5(8): 610-615.
  23. Kalaskar MG, Tatiya AU and Surana SJ. Evaluation of antioxidant potential and qualitative analysis of major polyphenols by RP-HPLC in *Luffa acutangula* var. amara Roxb. pericarp extracts. *Der Pharmacia Sinica*, 2016; 7(2): 13-20.
  24. Iyyamperumal U, Periyannanc M and Ilavarasand R. Antiinflammatory and in vitro antioxidant potential of extracts leaves of *Luffa acutangula* (var) amara in rodent model (rats). *Int J Pharm Pharm Sci*, 2013; 5(2): 79-83.
  25. Palash P, Sangeeta D, Narendra V, Kirti M, Sapna M and Anil K. Anti-inflammatory activity of ethanolic extract of *Luffa acutangula*. *World Journal of Pharmaceutical Research*, 2017; 6(6): 519-529.
  26. Gill NS, Arora R and Kumar SR. Evaluation of antioxidant, anti-inflammatory and analgesic potential of the *Luffa acutangula* Roxb. var. amara. *Research Journal of Phytochemistry*, 2011; 5(4): 201-208.
  27. Juma A, Pervin R, Al Azad S, Islam R, Rahman M, Kabir Z, Taznin I, Bashar A and Rahmatullah M. Antihyperglycemic and antinociceptive activity of methanolic extract of *Luffa acutangula* fruits. *Advances in Natural and Applied Sciences*, 2013; 7(5): 435-441.
  28. Prabhakar K and Jebanesan A. Larvicidal efficacy of some cucurbitaceous plant leaf extracts against *Culex quinquefasciatus* (Say). *Biores Tech*, 2004; 95: 113-114.
  29. Rahman M, Ahmed A, Sunny SS, Atanu SH, Faruque A and Rana S. In vitro Evaluation of cytotoxic and anthelmintic activity of *Luffa acutangula*, *Luffa aegyptiaca* and *Momordica cochinchinensis*. *British Journal of Pharmaceutical Research*, 2014; 4(2): 267 - 277.
  30. Fernandes LCB, Corderio. Evaluation of abortifacient effect of *Luffa acutangula* roxb in rats. *Journal of Animal and veterinary advances*, 2010; 9(8): 1255 - 1258.