AN UPDATED PHARMACOLOGICAL ACTIVITY OF COCCINIA INDICA (WIGHT & ARN.)

Mayank Kumar*1, Shashi Alok 1, Dilip Kumar Chanchal 1, Rohit Kumar Bijaulya 1, Rahul Deo Yadav 2 and Monika Sabharwal 3

Department of Pharmacognosy 1, Institute of Pharmacy, Bundelkhand University, Jhansi - 284128, Uttar Pradesh, India.
Department of Pharmacy 2, Moti Lal Nehru Medical College, Allahabad- 211001, Uttar Pradesh, India.
Society of Pharmaceutical Sciences and Research 3, Panchkula Haryana, India.

Abstract: Traditional system of medicine consists of large number of plants with various medicinal and pharmacological importances and hence represents a priceless tank of new bioactive molecules. Coccinia indica belongs to the family Cucurbitaceae. It is a rapidly growing, perennial climber or trailing vine. Traditionally different parts of this plant namely the roots, leaves and fruits are used in folklore medicine for several purposes like jaundice, diabetes, wound healing, ulcers, stomach ache, skin disease, fever, asthma, cough. The leaf and its constituents have been reported to possess anthelmintic activity, antioxidant activity, anti-inflammatory, analgesic and antipyretic activity, antimicrobial activity, antihyperglycemic activity, hepatoprotective activity. This review provides adequate information to develop suitable therapeutics out of these plant parts.

Introduction: Plants had been used for medicinal purposes long before recorded history. Ancient Chinese and Egyptian papyrus writings describe medicinal uses for plants as early as 3,000 BC. Indigenous cultures (such as African and Native American) used herbs in their healing rituals, while others developed traditional medical systems (such as Ayurveda and Traditional Chinese Medicine) in which herbal therapies were used. Researchers found that people in different parts of the world tended to use the same or similar plants for the same purposes.

Keywords:
Antidiabetic activity,
Antibacterial activity,
Coccinia indica (Ivy Gourd)

Correspondence to Author:
Mayank Kumar
Research Scholar,
Institute of Pharmacy,
Bundelkhand University,
Jhansi- 284128, Uttar Pradesh, India.
E-mail: mayank.pharma89@gmail.com

In the early 19th century, when chemical analysis first became available, scientists began to extract and modify the active ingredients from plants. Later, chemists began making their own version of plant compounds and, over time, the use of herbal medicines declined in favor of drugs. Almost one fourth of pharmaceutical drugs are derived from botanicals.

Recently, the World Health Organization estimated that 80% of people worldwide rely on herbal medicines for some part of their primary health care. In Germany, about 600 - 700 plant based medicines are available and are prescribed by some 70% of German physicians. In the past 20 years in the United States, public dissatisfaction with the cost of prescription medications, combined with an interest in returning to natural or organic remedies, has led to an increase in herbal medicine use. There are many herbal products proved to be
having good antidiabetic potential. *Coccinia indica* (Bimba, kanduri, Cucurbitaceae) is famous for its hypoglycemic and antidiabetic properties in Ayurvedic system of medicine. (Fig. 1) *Coccinia indica*, the ivy gourd, also known as baby watermelon, little gourd, gentleman's toes, tindora or gherkin (inaccurately) is a tropical vine. It is also known as *Cephalandra indica* ². It is indigenous to Bengal and other parts of India. *C. indica* grows abundantly all over India, Tropical Africa, Australia, Fiji and throughout the oriental countries.

The plant has also been used extensively in Ayurvedic and Unani practice in the Indian subcontinent ³. Seeds or fragments of the vine can be relocated and lead to viable offspring. This can occur when humans transport organic debris or equipment containing *C. grandis*. Once the ivy gourd is established, it is presumably spread by birds, rats, and other mammals.

In Hawaii, it has been suggested that the fruit may be dispersed by pigs ⁴. Long-distance dispersal is most commonly carried out by humans due to its culinary uses or by mistake. In certain parts of the U.S., the ivy gourd is known as Rashmato (singular) or Rashmati (plural). Some people have begun using the plural term Rashmatoes, since it is sounds more like potatoes or tomatoes. In parts of the Caribbean it is known as lizard food.

![Image of Coccinia Indica](https://example.com/coccinia-indica-image.png)

**FIG. 1: COCCINIA INDICA (ADOPTED FROM FLORA-EXOTICA)**

1.1. *Coccinia Indica* Wight & Arn:

A. Synonyms:

*Cephalandra, Physedra, Staphylosyce*

B. Scientific Classification:

Kingdom: Plantae

Order: Cucurbitales

Family: Cucurbitaceae

Sub family: Cucurbitoideae

Tribe: Benincaseae

Sub tribe: Benincasinae

Genus: *Coccinia* Wight & Arn.

Species: *Coccinia indica*

1.2 Morphological Profile: ⁵

1. Leaves: Leaves are 5-10 cm, long and broad, bright green above, paler beneath, studded and sometimes rough with papillae, palmately 5-nerved from a cordate base, often with circular glands between the nerves, obtusely 5-angled or sometimes deeply 5-lobed, the lobes broad, obtuse or acute, apiculate, more or less sinuate toothed, petioles 2 - 3.2 cm. long.

2. Flowers: Male flowers: Peduncles are 2 - 3.8cm. long and subfiliform. Calyx-tube is glabrous, broadly campanulate 4 - 5 mm. long. Corolla is 2.5 cm. long, veined, pubescent inside and glabrous outside. Female flowers: Peduncles are 1.3 - 2.5cm. long. Ovary is fusiform, glabrous and slightly ribbed.

3. Fruits: Fruits are fusiform-ellipsoid, slightly beaked, 2.5-5by 1.3-2.5 cm. sized, marked when immature with white streaks, bright scarlet when fully ripe.

4. Seeds: Seeds are obovoid and rounded at the apex, slightly papillose, much compressed and yellowish grey.

5. Roots: The fresh root is thick, tuberous, long tapering, more or less tortuous with a few fibrous rootlets attached to it. Roots are flexible, soft and break with a fibrous fracture. A transaction of root shows circular outline and is characteristic of storage type. Parenchyma is full of starch grains and thorough permeation of parenchyma with vascular elements is observed. The cork is composed of rows of cells.

2. Cultivation: *Coccinia indica* is a well-known vegetable grown in the coastal which is high in nutritive value. The ripe fruit which is red in color is a well-known anti diabetic & is being exported to many countries for this purpose.
Vegetable farming method is widely used for its cultivation. Both physical and chemical recommended for weed control. Hand-harvesting normally does not kill the plant but rather breaks the vine blankets into smaller pieces and the plant is able to re-establish when it touches the ground. These methods can make the infestation worse and further the need for more rigorous control methods. Picking the fruit and placing them in plastic bags can help decrease the seed back that is present with the soil. When utilizing chemical controls, that ivy gourd responded well to a thin-lined bark application of 100% Garlon 4 (triclopyr), leaving plants in place so as not to translocate the herbicide or spread the pest.

3. Chemical Constituents: Plant contains resins, alkaloids, fatty acids, flavonoids and proteins as chief chemical constituents. Aspartic acid, Glutamic Acid, Asparagine, Tyrosine, Histidine, Phenylalanine and Threonine, Valine, Arginine are also found. The methenolic extract of fruit contains alkaloids, steroids, tannins, saponins, ellagic acid, phenols, glycosides, lignans and triterpenoids.

Roots containes Triterpenoid, saponincoccinioside, Flavonoid glycoside oumibin 3-o- arabino furanoside, Lupeol, β-amyrin and β- sitosterol and Stigmast-7- en-3-one. (Table 1)

4. Medicinal Uses: The plant has wide spread medicinal uses as shown in Fig. 2. Many clinical trial studies has proven effectiveness and safety of this plant parts and derived formulations for antidiabetic effect. Anti-inflammatory, analgesic and antipyretic activity of fruit and leaves were also found to be significant.

### Table 1: Phytochemical Review of Plant Coccinia Indica

<table>
<thead>
<tr>
<th>Plant part</th>
<th>Constituent reported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roots</td>
<td>Triterpenoid, saponin coccinioside – k(i). C₄₁H₆₆O₁₂, Flavonoid glycoside 3-o- arabinofuranoside</td>
</tr>
<tr>
<td></td>
<td>3- o- β- (α-1- arabinopyranosyl)-(1→2) –β-d-glucopyranosyl- (1→3) β- hydroxylup – 20(29)- en-28- oic acid.</td>
</tr>
<tr>
<td></td>
<td>Lupeol, β-amyrin and β- sitosterol</td>
</tr>
<tr>
<td></td>
<td>Stigmast -7- en-3-one</td>
</tr>
<tr>
<td>Fruits</td>
<td>Taraxerone, taraxerol, and (24R)-24- ethylcholest- 5-en- 3β- ol glucoside</td>
</tr>
<tr>
<td></td>
<td>B- carotene, lycopene, cryptoxanthin, and apo- 6’- lycopenal</td>
</tr>
<tr>
<td></td>
<td>B- sitosterol and taraxerol</td>
</tr>
<tr>
<td>Aerial parts</td>
<td>Heptacosane, Cephalandrol, C₂₉H₄₆O tritriacontane C₃₁H₆₈</td>
</tr>
<tr>
<td></td>
<td>B- sitosterol alkaloids Cephalandrine a and Cephalandrine b</td>
</tr>
<tr>
<td>Whole plant</td>
<td>Aspartic acid, Glutamic Acid, Asparagine, Tyrosine, Histidine, Phenylalanine and</td>
</tr>
<tr>
<td></td>
<td>Threonine Valine Arginine</td>
</tr>
</tbody>
</table>

**FIG. 2: MEDICINAL USE OF COCCINIA INDICA**
Pharmacological activities:

4.1. Anthelmintic Activity: Methanol extract of Coccinia indica fruits in the concentration of 50 mg/ml showed potent anthelmintic activity against Pheretima posthuma.  

4.2. Antioxidant activity: Oral administration of ethanolic extract of Coccinia indica (leaf) extract (CLEt) (200 mg/kg body weight) for 45 days resulted in a significant reduction in thiobarbituric acid reactive substances and hydroperoxides in rats.  

4.3. Anti-inflammatory, Analgesic and Antipyretic activity: Aqueous extract of Coccinia indica (leaves) produced marked analgesic and anti-inflammatory activity at 300mg/kg dose when compared with standard drugs (Morphine and Paracetamol). The extract also showed significant anti-inflammatory activity. The activity was measured using tail flick model and yeast induced hyperpyrexia. The effect was equivalent to 25 mg/Kg dose of diaclofenac.  

4.4. Antimicrobial Activity: Petroleum ether and methanolic extract of Coccinia indica showed the highest antimicrobial activity against gram positive organisms (Bacillus cereus, S. pyrogen and S. aureus). Ethanol and aqueous extracts of Coccinia indica showed promising antibacterial activity against the E. aerogenes, Pseudomonas aeruginosa, Staphylococcus epidermidis, Bacillus subtilis and Salmonella typhimurium by agar well diffusion method and broth dilution method.  

4.5. Antihyperglycemic Activity: Chronic administration of Coccinia indica (fruits) extract at dose of 200mg/kg for 14 days reduces the blood glucose level of the diabetes induced animals as compared to diabetic control group. Dried extract of Whole plant was utilized. Ingredients present in the extract act like insulin, correcting the elevated enzymes G-6-P (ase), LDH in glycolytic pathway and restore the LPL activity in lypolytic pathway with the control of hyperglycemia in diabetes.  

4.6. Hepatoprotecetive Activity: Coccinia indica leave extract at dose 400 mg/kg bodyweight showed potent hepatoprotective activity in albino rats. Sylimarin was utilized as positive control. Reduction in SGPT and SGOT was observed. The other updated pharmacological studied done on Coccinia indica are mention Table 2 below:

<table>
<thead>
<tr>
<th>S. no.</th>
<th>Activity /Year</th>
<th>Model</th>
<th>Plant Part</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Antidiabetic activity 34(1992)</td>
<td>Alloxan diabetic albino rats</td>
<td>95% ethanolic extracts</td>
<td>Found to be active</td>
</tr>
<tr>
<td>2</td>
<td>Antidiabetic activity 35(2008)</td>
<td>Streptozotocin included diabetic rats</td>
<td>n-hexane extract</td>
<td>Found to be active</td>
</tr>
<tr>
<td>3</td>
<td>Antidiabetic activity with testicular disorders 36(2007)</td>
<td>Streptozotocin induced Diabetic Rat For Testicular Dysfunctions</td>
<td>Formulation of Musa paradisiaca, Tamarindus indica, E. jambolana and Coccinia indica</td>
<td>Found to be active</td>
</tr>
<tr>
<td>4</td>
<td>Antidiabetic activity 37(2003)</td>
<td>Normal and streptozotocin (STZ) diabetic rats.</td>
<td>Leaves</td>
<td>Evaluated for effect on blood glucose, plasma insulin, cholesterol, triglycerides, free fatty acids, and phospholipids and fatty acid compound. Of total lipids in liver, kidney and brain</td>
</tr>
<tr>
<td>5</td>
<td>Antidiabetic activity 38(1953)</td>
<td>Alloxan diabetes in rabbits</td>
<td>Roots</td>
<td>Lowered blood glucose by depressing its synthesis, on the one hand though depression of the key gluconeogenic enzymes glucose-6-phosphatase and fructose-1,6- biphosphatase and on the other by enhancing glucose</td>
</tr>
</tbody>
</table>
7 Hypoglycemic activity \(^\text{(40)}\) (1963) Normal rats Pectin isolated from the fruit Glycogen synthetase activity was highly significant significant redn. in phosphorylase activity

8 Hypoglycemic activity \(^\text{(41)}\) (1963) Normal rats Water soluble Alkaloid fraction Found to be active

9 MOA of hypoglycemic activity \(^\text{(12)}\) (1993) Glucose tolerance test Alcoholic extract of Coccinia indica (100mg/kg.), May be due to indirect stimulation of insulin secretion or to retardation of glucose absorption. Use of these drugs

10 Hypoglycemic activity \(^\text{(5)}\) (1972) Rabbits Alcoholic and aqueous extract of root powder Found to be active

11 Clinical trial in type 2 diabetic patients \(^\text{(34)}\) (1979) Double-blind, placebo-controlled, randomized trial Alcoholic extract of the herb Have potential hypoglycemic action in patients with mild diabetes

12 Clinical trial in diabetic patients \(^\text{(55)}\) (2008) Dried extract of Whole plant Ingredients present in the extract

13 Antidiabetic activity \(^\text{(46)}\) (1985) Dog Dried extract of Whole plant Found to be active

14 Antioxidant activity \(^\text{(47)}\) (2003) Streptozotocin-diabetic rats Ethanolic extract of leaves Found to be active

15 Anti-inflammatory activity \(^\text{(58)}\) (2004) Carrageenin and histamine induced paw edema Fruit juice powder Found to be active

16 Antinociceptive activity \(^\text{(48)}\) (2004) Writhing induced by acetic acid in mice fruit juice powder Found to be active

17 Post- and pre-treatment anti-inflammatory activity \(^\text{(49)}\) (2009) Carrageenan-induced paw oedema method Aqueous extract of fresh leaves Found to be active

18 Analgesic activity \(^\text{(59)}\) (2009) Tail flick model in rats Aqueous extract of fresh leaves Found to be active

19 Antipyretic activity \(^\text{(59)}\) (2009) Yeast-induced hyperpyrexia in rats Aqueous extract of fresh leaves Found to be active

20 Larvicidal activity \(^\text{(50)}\) (2008) Early fourth instar larvae of Aedes aegypti L. and Culex quinquefasciatus (say) (Diptera: Culicidae). Hexane, ethyl acetate, petroleum ether, acetone and methanol extracts of the leaf Citrullus colocynthis, C. indica Found to be active

21 Hypolipidemic activity \(^\text{(51)}\) (1997) Ethanol extract of leaves Found to be active

22 Hepatoprotective activity \(^\text{(52)}\) (2003) CCl\(_4\) induced hepatotoxicity in rats Ethanolic extract of fruits Found to be active

23 Antituberculosis activity \(^\text{(53)}\) (1958) Experimental tuberculosis in Guinea pigs Extract of fruit Found to be active

24 Sex mechanism \(^\text{(54)}\) (1952) Critical cytological investigation of different sex types Flower Found to be active

25 Antigibberellins \(^\text{(55)}\) (1973) Proliferated tissue Seed Found to be active

26 A Histopathological Study \(^\text{(56)}\) (1975) Gall formation due to attack of the larvae Coccinia indica agglutinin (CIA) Found to be active

27 Chitooligo saccharide specific lectin \(^\text{(57)}\) (1994) Chitooligo saccharide-specific lectin with two binding sites Fruit Found to be active

28 Coccinia indica agglutinin (CIA) by thermodynamic analyses \(^\text{(58)}\) (1998) Fluorescence spectra Found to have good activity

29 Antihypertensive Activity \(^\text{(59)}\) (2001) CCl\(_4\) Liver function Light petroleum, alcohol, extracts of the leaves Treatment of diabetes

30 Treatment of diabetes \(^\text{(60)}\) (2003) Lipid profile of Leaves water extract
<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
<th>Methods</th>
<th>Results</th>
</tr>
</thead>
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<td>31</td>
<td>The hypoglycemic activity&lt;sup&gt;63&lt;/sup&gt; (2004)</td>
<td>Injecting alloxan monohydrate intraperitoneally</td>
<td>Fasting blood sugar came down to almost normal value and improvement in glucose tolerance and serum lipid profile. The results of the present study indicate that the toluene fraction was the only active fraction. The active principles in this fraction were found to be triterpenes which may be responsible for the antidiabetic activity. Triterpenoids and carbohydrates were detected in water extract.</td>
</tr>
<tr>
<td>32</td>
<td>The stimulation of glucose transport in L8 myotubes&lt;sup&gt;62&lt;/sup&gt; (2006)</td>
<td>Glucose transport induced</td>
<td>Stem</td>
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<td>33</td>
<td>Induced diabetes mellitus&lt;sup&gt;65&lt;/sup&gt; (2008)</td>
<td>Administering streptozotocin (STZ) intraperitoneally</td>
<td>Leaves extract significantly lowered blood glucose level</td>
</tr>
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<td>34</td>
<td>Boon to Vegetable&lt;sup&gt;64&lt;/sup&gt; (2008)</td>
<td>The quality parameters of DRC-1</td>
<td>Fruit</td>
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<td>35</td>
<td>Antimicrobial activity&lt;sup&gt;65&lt;/sup&gt; (2009)</td>
<td>Well diffusion method</td>
<td>Fruit / organic extracts (petroleum ether and methanol) showed the highest activity</td>
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<tr>
<td>36</td>
<td>Antibacterial Activity&lt;sup&gt;66&lt;/sup&gt; (2010)</td>
<td>Agar well diffusion method and broth dilution method.</td>
<td>The aqueous and organic solvent (petroleum ether, chloroform and ethanol) extracts from the leaves</td>
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<td>37</td>
<td>Mucilage Extract as coagulant for water treatment&lt;sup&gt;67&lt;/sup&gt; (2010)</td>
<td>Coagulation-filtration test</td>
<td>Fruit mucilage extract</td>
</tr>
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<td>38</td>
<td>Antidiabetic effect&lt;sup&gt;68&lt;/sup&gt; (2010)</td>
<td>Alloxan induced diabetic rats</td>
<td>Aqueous fruit extract</td>
</tr>
<tr>
<td>39</td>
<td>Hepatoprotective activity&lt;sup&gt;69&lt;/sup&gt; (2010)</td>
<td>Carbon tetrachloride induced liver toxicity in rats</td>
<td>Diethyl ether extracts of the leaves</td>
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<td>40</td>
<td>Pharmacognostic and antihyperglycemic study&lt;sup&gt;70&lt;/sup&gt; (2010)</td>
<td>Post hoc Newman-Keuls multiple comparison test</td>
<td>Aqueous and ethanolic fruits extracts</td>
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<td>41</td>
<td>Evaluation of Anthelmintic Activity&lt;sup&gt;71&lt;/sup&gt; (2011)</td>
<td>Paralysis (P) and death (D) for &lt;i&gt;P. posthuma&lt;/i&gt; worms</td>
<td>Fruits/petroleum ether, ethyl acetate methanol and water as solvents</td>
</tr>
<tr>
<td>42</td>
<td>Mucilage as suspending agent in paracetamol suspension&lt;sup&gt;72&lt;/sup&gt; (2011)</td>
<td>Compound tragacanth, CI mucilage has the potential as a suspending agent even at lower concentration</td>
<td>Fruits</td>
</tr>
<tr>
<td>43</td>
<td>Protective effect&lt;sup&gt;73&lt;/sup&gt; (2011)</td>
<td>Alcohol combines with CCl&lt;sub&gt;4&lt;/sub&gt; and Paracetamol induced hepatotoxicity</td>
<td>Leaf extracts</td>
</tr>
</tbody>
</table>

Fruit / The dried alcoholic extract were a semisolid mass and were successively extracted with toluene, chloroform, ethyl acetate and n-butanol.
<table>
<thead>
<tr>
<th>Ref</th>
<th>Description</th>
<th>Methodology</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>44</td>
<td>Antihepatotoxic activities&lt;sup&gt;74&lt;/sup&gt; (2012)</td>
<td>CCl&lt;sub&gt;4&lt;/sub&gt; induced hepatotoxic Changes in male albino wistar rats, Isolated from ethanolic fruits extracts and Leaves</td>
<td>On hepatic liver peroxide, liver weight and antioxidant enzyme activities with reference to the control and standard hepatoprotective agent silymarin</td>
</tr>
<tr>
<td>45</td>
<td>Combined effect&lt;sup&gt;75&lt;/sup&gt; (2012)</td>
<td>Blood glucose level and certain other biochemical parameters in alloxan induced diabetic rats.</td>
<td>Intra-peritoneal administration of alloxan monohydrate produced significant increase in serum glucose levels</td>
</tr>
<tr>
<td>46</td>
<td>Proximate analysis, Phytochemical screening and Anti inflammatory activity&lt;sup&gt;76&lt;/sup&gt; (2012)</td>
<td>Carrageenan-induced rat hind paw edema was used as the animal model of acute inflammation</td>
<td>Inhibition of Prostaglandin synthesis</td>
</tr>
<tr>
<td>47</td>
<td>Wound healing activity&lt;sup&gt;77&lt;/sup&gt; (2011)</td>
<td>Wound model and wound model Swimming performance time test in mice Post Swimming Motor Function Test Cold-restraint stress</td>
<td>Significant promotion of wound healing activity</td>
</tr>
<tr>
<td>48</td>
<td>Studies on anti-stress and free radical scavenging activity&lt;sup&gt;78&lt;/sup&gt; (2010)</td>
<td>Egg hatching inhibition concentration</td>
<td>Possessed excellent larvicidal and egg hatching inhibition activity against &lt;i&gt;A. stephensi&lt;/i&gt;</td>
</tr>
<tr>
<td>49</td>
<td>Effect of leaf essential oil on egg hatchability and different larval&lt;sup&gt;79&lt;/sup&gt; (2010)</td>
<td></td>
<td>Found to be active On repellent effects of leaf extract was reported in the present study, confirm their potential for control of the mosquito Populations</td>
</tr>
<tr>
<td>50</td>
<td>Antilithiatic activity&lt;sup&gt;80&lt;/sup&gt; (2013)</td>
<td>Male albino rats The repellant efficacy was determined against three mosquito species at three concentrations viz., 1.0, 2.5, 5.0 mg/cm</td>
<td>This study is not a complete toxicity study. It emphasizes the call for carrying out toxicity studies even in natural plant products and drug of indigenous medicinal System</td>
</tr>
<tr>
<td>51</td>
<td>Ovicidal and Repellent Properties&lt;sup&gt;81&lt;/sup&gt; (2011)</td>
<td>Fruit Leaves extract, Methanol extract have most promising ovicidal Activity</td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>Anticonvulsant activity&lt;sup&gt;82&lt;/sup&gt; (2013)</td>
<td>Male albino rats</td>
<td>Found to be active</td>
</tr>
</tbody>
</table>

**CONCLUSION:** The multiple benefits of <i>Coccinia indica</i> it a true miracle of nature. Numerous studies have been conducted on different parts of <i>Coccinia indica</i>, this plant has yet developed as a drug by pharmaceutical industries. A detailed and systematic study is required for identification, cataloguing and documentation of plants, which may provide a meaningful way for the promotion of the traditional knowledge of the herbal medicinal plant.

**ACKNOWLEDGEMENT:** The authors are grateful to Dr. Shashi Alok Assistant Professor in Department of Pharmacy, Bundelkhand University, Jhansi, India for providing the his valuable guidance.

**CONFLICT OF INTEREST:** We declare that we have no conflict of interest.

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