A REVIEW ON PHARMACOLOGICAL ACTIVITIES OF POLYALTHIA_LONGIFOLIA L

Dhiren k Vaghela*
Department of Botany, Bioinformatics and Climate Change Impacts Management, School of Science, Gujarat University, Ahmedabad, Gujarat, India.

Dhruv Pandya
Department of Botany, Bioinformatics and Climate Change Impacts Management, School of Science, Gujarat University, Ahmedabad, Gujarat, India.

Hitesh Solanki
Department of Botany, Bioinformatics and Climate Change Impacts Management, School of Science, Gujarat University, Ahmedabad, Gujarat, India.

Article DOI: https://doi.org/10.36713/epra6429

ABSTRACT
Polyalthia longifolia L. is an ornamental tree (mostly used as an avenue tree) which belongs to Annonaceae. As per the review of the research papers it also has so many important chemical constituents in its different parts. These chemicals are alkaloids, flavonoids, phenols, terpenoids and essential oil etc that can be used for the preparation of different medicines for several diseases. In this review authors focused on the pharmacological properties and ethnomedicinal properties of the plant parts and their implementation in the pharmacological science. The plant part different extracts showed different types of pharmacological activities like Antibacterial activity, Antifungal activity, Antitumor (Anticancer activity), cytotoxic activity, Antioxidant activity, Anti-inflammatory activity, Antimalarial activity and Antithrombotic activity. Even the plant also has so many traditional medicinal uses. So, its not just an ornamental tree but it can be good resource for the secondary metabolites and considered as medicinally important plant.

INTRODUCTION
Medicinal plants play an important role in human’s life. Herbs and humans have a great relation with each other. At present days medicinals plants plays vital role in scientific development and holds much more hidden treasure to be explored as almost eighty percent human population in developing countries dependent on plant resources for their primary health care (Chandaka et al, 2018) [1]. Plant based therapy has been used as a vital component in traditional medicine system and also serves as the main source of inspiration for pharmaceutical drugs used in the defence against various diseases (Prateek Dixit. et al, 2014) [2]. The genus Polyalthia includes about 120 species found mainly in Africa, South and South Eastern Asia, Australia and New Zealand. Polyalthia longifolia is one of the most important indigenous medicinal plant in indian medicinal literature. Almost all the parts of this plant are used
in India for medicinal purposes for the treatments of various ailments and the significant medicinal properties was further reported through scientific researches (Subramanion L Jothy. et al,2013) (3). The plant grows through the tropical and subtropical parts of India up to an altitude of 1500 meter. A tall, evergreen, handsome, pyramid like, columnar tree, undived, growing up to 12 m or more. Branches short about 1-2 m or long, glabrous and pendulous. Leaves are alternate, extipulate, midly aromatic and it’s belongs to the family Annonaceae (Ram Bahor Saket and SB Singh. 2017) (4). Number of chemical constituents has been identified from the leaves such as azafluorene alkaloid and three new Aporphin N-oxide alkaloids (Doshi. et al, 2015) (5).

Scientific Name: Polyalthia longifolia L.

Common Names: False Ashoka, Buddha Tree, Green champa, Indian mast tree, and Indian Fir tree.

Taxonomical classification (According to Bentham & Hooker)

Kingdom: Plantae
Sub kingdom: Phanerogams
Class: Dicotyledons
Sub class: Polypetalae
Series: Thalamiflorae
Order: Ranales
Family: Annonaceae
Genus: Polyalthia
Species: longifolia L.

Morphological Characters: The plant grows throughout the tropical and subtropical parts of India up to an altitude of 1500 m. The plant is tall, evergreen, pyramid-like, columnar tree. Main stem straight, undivided, growing up to 12 m or more. Branches slender, short, about 1-2 m long, glabrous, and pendulous. Young plants have straight trunks and weeping pendulous branch. The longest branch is seen at the base and shorter at the end of the trunk, it gives conical crown appearance. Leaves are long, narrow dark green and glossy. Leaf blade are ovate-oblong shape to ovate-lanceolate shape with wavy margins. Flowers are delicate pale green colour with wavy petals. The flowers last for a short period. It is usually two to three weeks. Seals are ovate-triangular. Petals are greenish yellow. Fruits are borne in clusters of 10-20. It is usually void in shape. Initially fruits are green in colour but later it turns in to purple or black when ripe. Seeds are pale brown in colour and ovoid in shape. (Chandaka Lavanya et al, 2018) (1), (K.V Katkar et al, 2010) (6).

PHARMACOLOGICAL ACTIVITIES

Antibacterial Activity: Ghosh G. et al, 2011 (7) described that the petroleum ether extract of Polyalthia longifolia var. angustifolia stem bark can yield a highly potent form of novel antibacterial molecule due to presence of steroidal alkaloid, by the process of tube dilution of petroleum ether extract against Escherichia coli, Bacillus subtilis, Salmonella typhi, Proteus mirabilis, Pseudomonas aeruginosa, Klebsiella sp., Staphylococcus aureus. Manasa M. et al. 2014 (8) described antibacterial activity of methanolic extract of Polyalthia longifolia against a Gram-positive bacterium Staphylococcus aureus NCIM-2079 and two Gram negative bacteria Salmonella typhi MTCC-734 and klebsiella pneumoniae NCIM-2957 by inoculation in sterile nutrient broth at 37°C for 24-hour incubation, by the process of Agar well diffusion method Kavitha P A. et al, 2013 (9) described that the flavonoids of leaves of Polyalthia longifolia from methanolic extract is very effective bioactive compound against Staphylococcus aureus, Streptococcus faecalis, Pseudomonas aeruginosa, Bacillus subtilis and Escherichia coli.

Anticancer Activity: Hepatocellular carcinoma (HCC) is one of the most common life-threatening malignancies which accounts for nearly 85% of the primary malignant tumours of liver and is the third most common causes of cancer. A.J.M Christina. et al, 2014 (10) described that the methanolic extract of fruit of Polyalthia longifolia shows antioxidative activity, which reduced the effect of Diethylnitrosamine that causes DNA mutation in rats by dose dependent manner. S Rupachandra and D V L Sarada 2014 (11) shows the cytotoxic peptide isolated from the seeds of Polyalthia longifolia with an average mass of 679.8 by the process of Liquid chromatography-electrospray ionization-Mass spectrometry (LC-ESI-MS/MS) analysis, plays significant antiproliferative role against lung (A549) cancer cells at concentration of 10 µg/ml and cervical (HELA) cancer cells line at 30 µg/ml, respectively. Verma Monika et al, 2008 (12) described that the leaves extract (A001) and its chloroform fraction (F002) of Polyalthia longifolia inhibited cell proliferation of various human cancer cell lines in which colon cancer cells SW-620 showed maximum inhibition with IC50 value 6.1 µg/ml. According to Gaurav Mahesh Doshi and Hemant D. Une, 2015 leaves and root extract of Polyalthia longifolia and Carissa congesta respectively, shows good anticancer activity on human leukemia cell line MOLT4 and human breast cancer cell line MCF7, respectively by the process of sulforhodamine B (SRB) assay.

Antifungal Activity: Satish S, et al. 2010 (14) shows the fraction of petroleum ether extract of leaves of Polyalthia longifolia recorded highly significant.
antifungal activity against all the test bacteria like Fusarium equiseti, Fusarium lateritium, Aspergillus candidus and Penicillium chrysogenum etc, by the process of poisoned food technique. Dileep N, et al, 2013 [14] described antifungal activity of leaf and pericarp of Polyalthia longifolia against mycelial growth of two pathogenic fungi Fusarium oxysporum and Pythium aphanidermatum which are isolated from soft rot specimen of ginger by the process of poisoned food technique. K.V Katkar. et al, 2010 [6] shows the diterpenoids like 16α-hydroxy-cleroda-3,13(14)-Z-diene-15,16-olide and 16-oxo-cleroda-3,13(15)-E-diene-15-Oic acid, isolated from the hexane extract of the seeds of Polyalthia longifolia, demonstrated significant antibacterial and antifungal properties by the method of Bioassay monitored isolation. Swami Narsinghchandra Dev and Kantisree De, 2016 [16] described that the ethanolic and methanolic extract of bark and leaf of Polyalthia longifolia showed antifungal potential against Candida albicans and Candida krusei by agar well diffusion method.

**Anti-inflammatory Activity: **Sharma R K. et al, 2011 [17] reported that the aqueous extracts of Polyalthia longifolia show significant antiinflammatory activity as evident by decrease in the weight of granuloma tissue when compared to the standard drug Indomethacin by Cotton pellet granuloma test. Shibajee Mandal. et al, 2012 [18] shows antiinflammatory activity in both the ethanolic and aqueous extracts of leaves of Polyalthia longifolia due to the presence of flavonoids and phenolic compounds at various time intervals that was evaluated by Carrageenan-induced paw edema model. Denaturation of protein is well documented cause of inflammation. Ogbonmade R.S. et al, 2019 [19] documented anti-inflammatory effect of 56.74±0.99 % in ethanolic extract, 55.57±0.22 % and 35.59±3.39 % in fresh and dry leaves aqueous extract respectively, which shows inhibitory effect on protein denaturation by using (comparing) diclofenac sodium the standard drug. Chandaka Lavanya et al, 2018 [1] revealed the most anti-inflammatory effect of the three doses of methanolic extract (300, 600, 900 mg/kg) of Polyalthia longifolia leaves by comparing it with standard Diclofenac sodium. Chandi Vishala Thonangi and Annapurna Akula 2018 [20] described that the methanolic extract from seed of Polyalthia longifolia exhibit significant dose dependent 58.46% anti-inflammatory activity with comparison of 56.92% diclofenac standard drug by inhibiting the acute inflammatory mediators released by egg albumin.

**Anti-malarial Activity: **D. Santha kumari. et al, 2016 [21] concluded that the methanolic extract of fruit of Polyalthia longifolia contain major chemical classes such as phenols and alkaloids which exhibits good in vitro antiplasmodial activity against CQ-Resistance strain of Plasmodium falciparum. Bethel Kwansa-Bentum. et al, 2019 [22] described that the ethyl acetate extract of leaves of Polyalthia longifolia exhibits antiplasmodial activity with IC50 value of 9.5 µg/ml by using SYBR Green assay method. Stephen Y Gbedemaa, et al, 2015 [23] described that the obtained compounds such as 16-hydroxycleroda-3,13(14)-diene-16, 15-olide,16-oxocleroda-3,13(14)E-dien-15-Oic acid and 3,16- dihydroxycleroda-4(18),13(14) Z-dien-15,16-olide from the ethanolic extract of stem bark of Polyalthia longifolia shows potent antiplasmodial activity for treating malaria.

**Antioxidant Activity:** According to Goutam Ghosh. et al, 2010 [24] the methanolic extract of Polyalthia longifolia showed increased scavenging activity against free radicals due to presence of more antioxidant principles. The phytochemical study on extract of Polyalthia longifolia has showed that flavonoids and tannins are abundant in this plant. Flavonoids and tannins have been reported to be antioxidative action in biological system, acting as scavenger of singlet oxygen and free radicals. From the study, Dileep N. et al, 2012 [25] found that the phenolic content in the ripe pericarp of Polyalthia longifolia could be responsible for the antioxidant activity which was observed by the DPPH free radicle scavenging method. Shibajee Mandal et al, 2012 [18] shows antinflammatory activity in both the ethanolic and aqueous extracts of leaves of Polyalthia longifolia due to the presence of flavonoids and phenolic compounds at various time intervals that was evaluated by Carrageenan-induced paw edema model in the presence of standard Indomethacin against Albino rats. Santhepete N Manjula. et al, 2010 [26] shows DPPH scavenging activity of Polyalthia longifolia in methanol at room temperature with the presence of ascorbic acid as standard, which reduce ferric ion and inhibited lipid peroxidation which proves its antioxidant activity. According to Subramanion L Jothy. et al, 2015 [27] the antioxidant molecules in Polyalthia longifolia leaf extract might also play an important role in the prevention of genotoxic damage. Therefore, the genoprotective effect of Polyalthia longifolia leaf extract may have also rendered a radioprotective effect as observed in the present study. Ojewuyi O.B. et al, 2014 [28] described that the obtained phenols by the Harborne standard detection chemical test from the young and mature leaves of Polyalthia longifolia shows antioxidant activity which prevent oxidative damage to biomolecules such as DNA, lipids, and proteins that play a role in chronic diseases such as cancer and cardiovascular disease.

**Antiulcer Activity:** P Malairajan. et al, 2008 [29] described that the ethanolic extract of leaves of Polyalthia longifolia are used with some standard drug like ranitidine, sucralfate, and omeprazol to performe three different mechanisms like
Antisecretory, Cryoprotective, Proton pump inhibition, which eventually prove reduction of ulcer in Rats. O Timothy et al, 2019 [30] also described that 800 mg/kg methanolic extract of leaves of Polyalthia longifolia shows 100% inhibition of gastric ulcer in rats with comparison of standard drug, ranitidine. According to Prateek Dixit. et al, 2014 [31] the ethanolic extract of polyalthia longifolia was investigated for anti-ulcer activity against aspirin plus pylorous ligation induced gastric ulcer in rats, HCl – ethanol induced ulcer in mice and water immersion stress induced ulcer at 300 mg/kg body weight which showed a significant reduction in gastric volume, free acidity and ulcer index as compared to control.

**Cytotoxic Activity:** O Atolani et al, 2019 [32] carried out cytotoxic assay to evaluate the potential cytotoxicity of Soxhlet extraction of seed of Polyalthia longifolia by using HFF on human foreskin fibroblast cells. Phadnis AP et al, 1988 [33] described cytotoxic activity of well known diterpenes compounds such as (-)-16-oxoclerod-3, 13(14) Edien-15-0ic acid and (-)-16α-hydroxycleroda-3,13 (14)Z-dien-15,16-olide which are obtained from the leaves of Polyalthia longifolia. Alagbe J.O, 2017 [34] described Pharmacological studies on the bark and leaves of the Polyalthia longifolia which shows effective antimicrobial activity, cytotoxic function and hypotensive effects.

**ETHNOMEDICINAL USES**

(Tripta Jain and Kanika Sharma 2011) [34] described ethnopharmacological uses of Polyalthia longifolia like traditionally dried bark powder is given with milk for relief in menorrhagia and leucorrhoea, decoction made from bark is used to cure mouth ulcers, the seeds of this plant were used as febrifuge, the bark is also used as a febrifuge in Balasore district of Orissa. It is also used as a very popular herb in Bangladesh due to its traditional uses in treatment of rheumatism, bone fracture and gastric ulcer (M. Moniruzzaman. et al, 2015) [35]. The bark is used in skin diseases, fever, diabetes, hypertension and helmenthiasis. (M. Marthanda Murthya. et al, 2005) [36]. The leaves, stem bark and root extracts of Polyalthia longifolia var. Pendula possess high antipyretic activities comparable to aspirin. This may provide scientific evidence for its use as a traditional remedy for fever (K. Annan. et al, 2013) [37]. The bark is used for the treatment of pyrexia and other bleeding disorders in India (Chandaka Lavaneya. et al, 2018) [1]. Tribal people of Khargone, Madhya Pradesh use stem bark to cure malignant tumor also the fresh stem bark juice is used in the treatment of the various digestive disorders. (Prashith Kekuda TR et al, 2014) [38], (Rashmi Saxena Pal. et al, 2016) [39], The leaves of Polyalthia longifolia is also prescribed as herbal recipe by traditional medicine practitioners (TMP) in Ilorin, Kwara State for the treatment of Diabetes mellitus, malarial fever, cough and hypertension (M. K. Bello and L. Lajide 2011) [40], (Sengottuvelu S. et al, 2014) [41] shows its uterine disorder, and wound healing activity in rats from the ethanolic extract of leaves of Polyalthia longifolia. The plant has its utility in colitis, diarrhea, anorexia, sore throat, cough (Shazid M. D. Sharker. et al, 2010) [42] and helminthiasis as well as vitiated condition of Vatta and Pitta. (Patil Ankita Sanjeev and Gaurav Mahesh Doshi 2018) [43].

**CONCLUSION**

In this review we attempted to bring together the pharmacological, phytochemical and ethnomedicinal information on Polyalthia longifolia, a medicinally important Polyalthia longifolia used in the traditional system of medicine and an ancient remedy to be explored for novel therapeutic uses. The medicinal applications of this plant and the countless possibilities for investigation still remain in relatively newer areas of its function. So, we can say that the plant is not only used for an ornamental purpuse but its good medicinal plant that can be further studied with phytochemistry aspects.

**REFERENCES**

1. Chandaka Lavaneya, Battu Ganga Rao, Devarakonda Ramadevi (2018), Phytochemicals and Pharmacological studies on Polyalthia longifolia, International Journal of Pharmaceutical Science and Research. 3(4); 01-07
2. Prateek Dixit, Tripti Mishra, Mahesh Pal, T.S Rana, D.K Upreti (2014), Polyalthia longifolia and its Pharmacological Activities, International Journal of scientific and Innovative Research.; 2(1); 17-25
3. Subramanian L Jothy, Yee Siew Choong, Dharmaraj Saravanan, Subramanian Deivanai, Lachimanan Yoga Latha, Soundarajan Vijayarutha, Sreenivasan Sasidharan (2013), Polyalthia longifolia Sonn: An Ancient remedy to Explore for Novel Therapeutic Agents, Research journal of pharmaceutical, Biological and chemical Sciences.; 4(1); 714-730
4. Ram Bahor Saket, SB singh (2017), Phytochemical and antimicrobial study of Polyalthia Longifolia, International Journal of Botany Studies.; 2(2); 25-27
5. Gaurav Mahesh Doshi, Pratip Kashinath Chakkar, Hemant Devidas Une (2015), Elucidation of β-sitosterol from Benincasa hispida seeds, Carissa congesta Roots and Polyalthia longifolia Leaves by High Performance Thin Layer Chromatography, PHCOG Journal.; 7(4); 221-227
6. K.V Katkar, A.V Suthar, V.S. Chauhan (2010), The chemistry, pharmacologic, and therapeutic
applications of Polyalthia longifolia, pharmacognosy review, 4(7): 62-68

7. Ghosh G, Subudhi B. B, Badajena L.D, Ray J, Mishra M.K, Mishra S.K (2011) Antibacterial activity of Polyalthia longifolia var. angustifolia stem bark extract, International journal of Pharma Tech Research. 3(1); 256-260

8. Manasa M, Vivek M. N, Yashoda kambar, Onkarappa R, Prashith Kekuda T.R. (2014), Antimicrobial activity of leaf and pericarp extraction of Polyalthia longifolia, Journal of pharmaceutical and scientific Innovation.; 3(3); 221-225

9. Kavitha P A, Pavan Kumar, Narasimah Murthy T.P, Gopinath S. M (2013), Antibacterial activity of Polyalthia longifolia against hospital isolates of Bengaluru District, International journal of Latest Research in Science and Technology, 2(1); 508-510

10. A.J.M Christina, Jayaraman Rajangam, Bibhu Prasad Panda (2014), Anticancer potential of Polyalthia longifolia fruits in DEN/PB induced hepatocellular carcinoma in rats, International journal of research in pharmacy & pharmacotherapeutics. 3(3); 163-168

11. S Rupachandra, D V L Sarada (2014), Anti-proliferative and apoptotic properties of peptide from the seeds of Polyalthia longifolia against human cancer cell lines, International journal of Biochemistry & Biophysics, 51,127-134

12. Verma Monika, Singh Shashank K., Bhashan Shashi, V K Sharma, Prabhuj Datt, B K Kapahi, A K Saxena. (2008) In vitro cytotoxic potential of Polyalthia longifolia on human cancer cell lines and induction of apoptosis through mitochondrial-dependent pathway in HL60 cells, Chemico-Biological Interactions, 171(1); 45-56

13. Gaurav Mahesh Doshi, Hemant D. Une (2015) In vitro cytotoxicity studies on Carissa congesta, Polyalthia longifolia, and Benincasa hispida extracts by Sulforhodamine B assay method, International Journal of Green Pharmacy, 9 (No 3)

14. Satish S, Raghavendra, M.P., Mohana D.C and Raveshva, K.A (2010), In vitro evaluation of the antifungal potentiality of Polyalthia longifolia against some sorghum grain moulds, Journal of Agricultural Technology, 6(1); 135-150

15. Dileep N, Syed Jusaid, Rakesh KN, Prashith Kekuda TR, Noor Nawaz AS (2013) Antifungal activity of Leaf and Pericarp of Polyalthia longifolia Against Pathogens Causing Rhizome Rot of Ginger, Science, Technology and Arts Journal. 2(1); 56-59

16. Swami Narasinghchandra Dev, Kanti shrree De (2016) Antifungal activity of Polyalthia longifolia Somn. extracts against Candida species, Indian Journal of Applied and Pure Biology. 31(1); 71-73

17. Sharma R K, Mandal S, Rajani GP, Gupta N, Srivastava DP (2011) Antielcuer and Antiinflammatory Activity of Fresh Leave Extracts of Polyalthia Longifolia In Rats, International Journal of Drug Development & Research.3(1); 351-359

18. Shibajee Mandal, Gurugadadhallhi P. Rajani, Rajesh Kumar Sharma, Nakul Gupta (2012) In vitro antioxidant and antiinflammatory potentiality of Polyalthia longifolia in rats, Indian Journal of Pharmacology. 44(2); 277-278

19. Ogbomade R.S, Asara A.A, Eboh A.S (2019) In Vitro Anti-inflammantory Properties of Leaf Extract of Polyalthia longifolia Extract, The Pharmaceutical and Chemical Journal. 6(3); 112-115

20. Chandi Vishula Thonangi, Annapurna Akula. (2018) In vitro Anti-Oxidant and Anti-Inflammatory Activity of Polyalthia longifolia (Sonn.) Thwaitse Seeds, International Journal of Pharmaceutical Science and Research. 9(9); 3774-3780

21. D. Santhu Kumari, P.V.V Satish, K. Somaiah, N. Sree Rekha P. Brahman, K. Sunita (2016) Antimalarial Activity of Polyalthia longifolia (False Ashoka) Against Chloroquine Sensitive Plasmodium falciparum 3D7 strain, World Journal of Pharmaceutical Science. 4(6); 495-501.

22. Bethel Kwansa-Bentum, Kojo Agymen, Jeffrey Larbi-Akor, Claudia Anyigua, Regina Appiah-Opong (2019) In Vitro Assessment of Antiplasmodial Activity and Cytotoxicity of Polyalthia longifolia Leaf Extracts on Plasmodium falciparum Strain NF54, Malaria Research and Treatment, 2019.

23. Stephen Y Gbedema, Marcel T. Bayor a, Kofi Annan b, Colin W. Wright (2015) Clerodane diterpenes from Polyalthia longifolia (Sonn) Thw. var. pendula: Potential antimalarial agents for drug resistant Plasmodium falciparum infection, Journal of ethnopharmacology, 169; 176-182

24. Goutam Ghosh, Durga M. Kar, Bharata B. Subudhi and Saqar K. Mishra (2010) Antihyperglycemic and antioxidant activity of stem bark of Polyalthia longifolia var. angustifolia, Scholars Research Library. 2(2); 206-216

25. Dileep N, Rakesh K.N, Syed Jusaid, Poornima G, Swarnaalatha S.P, Prashith Kekuda T.R (2012) In vitro Antioxidant Activity of Ripe Pericarp of Polyalthia longifolia Thw, Research Journal of Pharmacy and Technology. 5(10); 1312-1315

26. Santhepete N. Manjula, Muthumjaya Kenganora, Vipan K. Parihar, Suryakant Kumar, Pawan G. Nayak, Nitesh Kumar, Karkala Sreedhara Ranganath Pai, and Chummallamudi Mallikarjunu Rao (2010) Antitumor and antioxidant activity of Polyalthia longifolia stem bark ethanol extract, Pharmaceutical Biology, 48(6); 690-696

27. Subramanian L. Jothi, Tamio Saito, Jagat R. Kanwar, Yeng Chen, Aculn Aziz, Leong Yin-Hui, Sreenivasan Sasidharan (2015) Radioprotective activity of Polyalthia longifolia standardized extract against X-ray radiation injury in mice,
Physica medica, 2015, doi: 10.1016/j.phymed.2015.10.090

28. Ojewusi, O. B., Ajiboye, T. O., Adebanjo, E. O., Balogun, A., Mohammed, A. O. (2014) Proximate composition, phytochemical and mineral contents of young and mature Polyalthia longifolia Sonn. leaves, Fountain Journal of Natural and Applied Sciences. 3(1); 10-19

29. P. Malairajan, Geethe Gopalkrishnan, S. Narasimhan, K. Jessi kala veni. (2008) Evaluation of antiuicfer activity of Polyalthia longifolia Sonn. Thwates in experimental animals, Indian Journal of Pharmacology. 40(3) 126-8, doi: 10.4103/0253-7613.42306.

30. Timothy O. Amos, O., Gabriel, O.B., Odega, K.L. Okoro, Q.R. and Idu, M. (2019) Gastro-Protective Activity of Methanol Leaf Extract of Polyalthia longifolia (Sonn.) Thw. on Ethanol-Induced Ulceration in Rats, African Scientist. 20(1)

31. O Atolani, E. T. Arch O. S. Oguntoye M. F. Zubair O. A. Fabiyi R. A. Oyegoke D. E Tarigha N. Adamu O. S. Adeyemi L. Kambizi G. A. Olatauji, (2019) Chemical composition, antioxidant, anti-lipooxygenase, antimicrobial, anti-parasite and cytotoxic activities of Polyalthia longifolia seed oil, Medicinal Chemistry Research. 28: 515-527

32. Phadnis AP, Patwardhan SA, Dhaneswar NN, Tavale SS, Row TNG. (1988) Clerodane diterpenoids from Polyalthia longifolia. Phytochemistry. 27(9); 2899-2901

33. Alagbe J.O, (2017) Effect of Dietary Inclusion of Polyalthia longifolia Leaf Meal as Phytobiotic Compared with Antibiotics on the Nutrient Retention, Immune Response and Serum Biochemistry of Broiler Chicken, Greener Journal of Agricultural Sciences. 7(3); 074-081

34. Tripta Jain, kanika Sharma (2011) Antibacterial Activity of the Stem bark Extracts of Polyalthia longifolia Benth. & Hook. Against Selected Microbes, Journal of Pharmacy Research. 4(3); 15-17

35. Md. Moniruzzaman, Alifa ferdous, Fatama Wahib Bokal, (2013) Evaluation of antinociceptive activity of ethanol extract of bark of Polyalthia longifolia, Journal of Ethnopharmacology. 172; 364-367

36. M. Marthanda Murthy, M. Subramanyama, M. Hima Bindub, J. Arnapurna (2005) Antimicrobial activity of clerodane diterpenoids from Polyalthia longifolia seeds, Fitoterapia. 76: 336-339

37. K. Annan, R. A. Dickson, K. Sarpong, C. Asare, K. Ampomah, E. Woode (2013) Antipyretic activity of Polyalthia longifolia Benth. & Hook. F. var. pendula (Annonaceae), on lipopoly saccharide-induced fever in rats, Journal of Medical and Biomedical Sciences, 2(1); 8-12

38. Prashith Kekuda, Dileep N, Rakesh KN, Syed Junaid and Raghavendra HL (2014) Elemental Analysis and Bioactivities of Ripe and Utripe Pericarp of Polyalthia longifolia (Annonaceae), Science, Technology and Arts Research Journal. 3(2); 68-75

39. Rashmi Saxena Pal, Yogendra Pal, Dr. AK Rai, Dr. Purnav Wal, Ankita Wal, Ashish Srivastava, Suresh Chandra, Nikita Saraswat (2016) Physico-chemical and phytochemical evaluation of crude drug powder (leaves) of Polyalthia longifolia, Journal of Pharmacognosy and Phytochemistry. 5(3); 212-213

40. M. K. Bello, L. Lajide (2011) Antidiabetic and hypolipidaemic activities of methanolic extract of Polyalthia longifolia leaf var pendular (Annonaceae) in Streptozotocin-induced type II diabetic rats. NISEB JOURNAL, Vol 11(No 2)

41. Balamuruganavelu, S. Premal, K.R, Jaikumar, S, Sengottuvelu. S (2014) Wound Healing Activity of Ethanolic Extract of Polyalthia Longifolia Leaves in Excision Wound Model in Rats. International Research Journal of Pharmaceutical and Applied Sciences, 4(2); 78-80

42. Shazid M. D, Sharker, Israt Jahan Shahid (2010) Assessment of antibacterial and cytotoxic activity of some locally used medicinal plants in Sundarban mangrove forest region, African Journal of Pharmacy and Pharmacology.4(2); 66-69

43. Patil Ankita Sanjeev, Gaurav Mahesh Doshi (2018) Chemical Constituents from Polyalthia longifolia seeds extract by Gas Chromatography-Mass Spectrocopy (GC-MS) studies, Research Journal of Pharmacy and Technology. 11(6); 2489-2492