

Assessment of Nutritional, Chemical and Biological Potential of *Cajanus cajan* (L.) Millsp.

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Abstract: *In this paper deals with the genus Cajanus (Family: Fabaceae) consists of approximately 37 species, and Cajanus cajan (C. cajan) is a significant member of the genus. It is a commercial legume crop widely grown in sub-tropical and semi-arid tropical areas of the world. C. cajan is well known for its folk medicinal uses to treat various disorders, such as toothache, dizziness, diabetes, stomachache, female ailments and chronic infections. These properties have been linked to the presence of several value-added nutritional and bioactive components. Different solvent extracts from C. cajan (leaves, root, stem and seeds) have been evaluated for their phytochemical and biological activities, namely antioxidant, antimicrobial, antidiabetic, neuroprotective, and anti-inflammatory effects. Taken together, and considering the prominent nutraceutical and therapeutic properties of C. cajan, this review article focuses on the important details including ethnomedicinal uses, chemical composition, biological applications and some other medicinal aspects related to C. cajan nutraceutical and pharmacological applications.*

Keywords: legumes; *Cajanus cajan*; bioactive compounds; nutraceuticals; bioactive effects.

REFERENCES

- [1]. Abdulkareem, K.A.; Olayinka, B.U.; Danzaki, M.M.; Idris, R.; Kareem, I.; Ayinla, A.; Sagaya, A.; Mustapha, O.T. Genetic variability via protein electrophoresis among some Nigerian accessions of pigeon pea (*Cajanus cajan*). *Rom. J. Biol. Plant Biol.* 2021, 66, 55-64. Nix, A.; Paull, C.A.; Colgrave, M. The flavonoid profile of pigeonpea, *Cajanus cajan*: A review. *Springer Plus* 2015, 4, 125. [Cross Ref] [12. 13.
- [2]. Abdelgahyoum, A.M.; Abdelkarim, A.M.; Shayoub, M.; Osmanactivity of *Cajanus cajan* leaves. *World J. Pharm. Res.* 2016, 6, 115-128. leaves of *Mangifera* leaves of antimicrobial Ahomadegbe, M.; Ladekan, E.; Assogba, F.; Agbonon, A.; Gbenou, J. Phytochemical and toxicity studies of the indica, *Cajanus cajan* and of *Piliostigma thonningii*, acclimated in Benin, used against diarrheal diseases. *J. Pharmacogn. Phytochem.*
- [3]. Adama, K.; Almamy, K.; germination and anthelmintic activity of *Cajanus cajan* on sheep. *J. Chem. Pharm. Res.* 2016, 8, 403-410. ; Mu, F.; Fu, Y.; Zu, Y.; Yao, M. *Hypocrea lixii*, novel endophytic fungi producing
- [4]. Aggarwal, A.; Nautiyal, U.; Negi, D. Characterization and evaluation *Int. J. Rec. Adv. Sci. Tech.* 2015, 2, 21-26. [CrossRef] of *Cajanus cajan*
- [5]. Akande, K.; Abubakar, M.; Adegbola, T.; Bogoro, S.; Doma, U. Chemical evaluation of the nutritive quality of pigeon pea [*Cajanus cajan* (L.) Millsp.]. *Int. J. Poult. Sci.* 2010, 9, 63-65. [CrossRef]
- [6]. Antioxidants, and Biological 48. Ashidi, J.; Houghton, P.; Hylands, P.; Efferth, T. Ethnobotanical survey and cytotoxicity testing of plants of South-western Nigeria used to treat cancer, with isolation of cytotoxic constituents from *Cajanus cajan* Millsp. leaves. *J. Ethnopharmacol.* 2010, 128,] [PubMedeffect of 501-512. [CrossRef49. Chang, H.-Y.; Wu, J.-R.; Gao, W.-Y.; Lin, H.-R.; Chen, P.-Y.; Chen, C.-I.; Wu, M.-J.; Yen, J.-H. The cholesterol-modulating methanol extract of pigeon pea (C...
- [7]. Ariraman, M.; Bharathi, T.; Dhanavel, D. Studies on the effects of mutagens on cytotoxicity behaviour in Pigeon pea (*Cajanus cajan* (L.) Millsp) Var. CO-7. *J. Appl. Adv. Res.* 2016, 1, 25-28. [CrossRef]
- [8]. Da Costa, I.M.; Pedrosa, E.C.G.A.; de Carvalho Bezerra, A.P.; Fernandes, L.C.B.; de Paiva Cavalcanti, J.R.L.; Freire, de Araújo, D.P.; do Rego, A.C.M.; Araujo Filho, I.; Pinheiro, F.I. Extracts and Essential Oils from Medicinal Plants and Their Neuroprotective Effect. In *Neuroprotection-New Approaches and Prospects*; IntechOpen: London, UK, 2020. . 2010, 33, 1611-1632. [Cross Ref] [PubMed]

- [9]. De Ron, A.M. Grain Legumes; Springer: New York, NY, USA, 2015; Volume 10.
- [10]. Dutta, A.; Trivedi, A.; Nath, C.P.; Gupta, D.S.; Hazra, K.K. A comprehensive review on grain legumes as climate-smart crops: Challenges and prospects. *Environ. Chall.* 2022, 7, 100479. [Cross Ref]
- [11]. Fuller, D.Q.; Murphy, C.; Kingwell-Banham, E.; Castillo, C.C.; Naik, S. *Cajanus cajan* (L.) Millsp. origins and domestication: The South and Southeast Asian archaeobotanical evidence. *Genet. Resour. Crop Evol.* 2019, 66, 1175-1188. [CrossRef]
- [12]. Ganapathy, K.; Gnanesh, B.; Byre Gowda, M.; Venkatesha, S.; Gomasha, S.S.; Channamallikarjuna, V. AFLP analysis in pigeonpea (*Cajanus cajan* (L.) Millsp.) revealed close relationship of cultivated genotypes with some of its wild relatives. *Genet. Resour. Crop Evol.* 2011, 58, 837-847. [CrossRef]
- [13]. Huang, M.-Y.; Lin, J.; Lu, K.; Xu, H.-G.; its derivatives. *J. Agric. Food Chem.* 2016, 64, 2893-2900. [CrossRef] [PubMed] Hepatoprotective effect of *Cajanus cajan* on tissue defense system in D-galactosamine-induced Akinloye, O.A.; Olaniyi, M.O. hepatitis in rats. *Turk. J. Biochem./Turk Biyokim. Derg.* 2011, 36, 237-241. Maduagwu, E.N. Antioxidant and hepatoprotective effect of *Cajanus cajan* in N
- [14]. IPCBEE, Hong Kong, China, Wu, N.; Fu, K.; Fu, Y.-J.; Zu, Y.-G.; Chang, F.-R.; Chen, Y.-H.; Liu, X.-L.; Kong, Y.; Liu, W.; Gu, C.-B. Antioxidant extracts and main components of pigeonpea [*Cajanus cajan* (L.) Millsp.] leaves. *Molecules* 2009, 14, 1032-1043. [CrossRef] ; Adebayo, M.A.; Ogunwande, I.A. Constituents of *Cajanus cajan* (L.) Millsp., Moringa
- [15]. Iweala, E.E.J.; Egbavbokun, W.O.; nitrosodiethylamine-induced liver damage. *Sci. Pharm.* 2019, 87, 24. [Cross Ref]
- [16]. Jeevarathinam, G.; Chelladurai, V. Pigeon pea. In *Pulses*; Springer: Berlin/Heidelberg, Germany, 2020; pp. 275-296.
- [17]. Karpavičienė, B. Traditional Uses of Medicinal Plants in South-Western Part of Lithuania. *Plants* 2022, 11, 2093. [CrossRef] [PubMed] 17.
- [18]. Khanum, R.; Mazhar, F.; Jahangir, M. Antioxidant evaluations of polar and non-polar Plants Res. 2015, 9, 193-198. nutrient digestibility
- [19]. Kim, Y.C. Neuroprotective phenolics in Geng, Z.-Z.; Sun, P.-H.; Chen, W.-M. Anti-inflammatory effects of cajanin stilbenedicinal plants. *Arch. Pharm. Res* acid and
- [20]. Kong, Y.; Wei, Z.-F.; Fu, Y.-J.; Gu, C.-B.; Zhao, C.-J.; Yao, X.-H.; Efferth, T. Negative-pressure cavitation extraction of cajanin stilbene acid and pinostrobin from pigeon pea [*Cajanus cajan* (L.) Millsp.] leaves and evaluation of antioxidant activity. *Food Chem.* 2011, 128, 596-605. [CrossRef]
- [21]. Mahitha, B.; Archana, P.; Ebrahimzadeh, M.H.; Srikanth, K.; Rajinikanth, M.; Ramaswamy, N. In vitro antioxidant and pharmacognostic studies of leaf extracts of *Cajanus cajan* (L.) millsp. *Indian J. Pharm. Sci.* 2015, 77, 170-177. [PubMed]
- [22]. Maphosa, Y.; Jideani, V.A. The role of legumes in human nutrition. In *Functional Food-Improve Health Through Adequate Food*; Intech Open: London, UK, 2017; Volume 1, p. 13.
- [23]. Millar, K.A.; Gallagher, E.; Burke, R.; McCarthy, S.; Barry-Ryan, C. Proximate composition and anti-nutritional factors of fava-bean (*Vicia faba*), green-pea and yellow-pea (*Pisum sativum*) flour. *J. Food Compos. Anal.* 2019, 82, 103233. [CrossRef]
- [24]. Mula, M.; Saxena, K. Lifting the Level of Awareness on Pigeonpea-A Global Perspective; International Crops Research Institute for the Semi-Arid Tropics: Telangana, India, 2010.
- [25]. Nahar, L.; Nasrin, F.; Zahan, R.; Haque, A.; Haque, E.; Mosaddik, A. Comparative study of antidiabetic activity and *Tamarindus indica* in alloxan-induced diabetic mice with a reference to in vitro antioxidant activity. *Pharmacogn. Res.* 2014, 6, 180-187. fractions of *Cajanus cajan* seeds. *J. Med.*
- [26]. Nwachukwu, E.; Uzoeto, H.O. Antimicrobial activities of leaf of *Vitex doniana* and *Cajanus cajan* on some bacteria. *Researcher* 2010,
- [27]. Nwodo, U.; Ngene, A.; Iroegbu, C.; Onyedikachi, O.; Chigor, V.; Okoh, A. In vivo evaluation of the antiviral activity of *Cajanus cajan* on measles virus. *Arch. Virol.* 2011, 156, 1551-1557. [CrossRef]

- [28]. Obiorah, S.; Eze, E.; Obiorah, D.; Orji, N.; Umedum, C. Phytochemical and antimicrobial studies *Cajanus cajan* and *Eucalyptus Globulus*. In Proceedings of the International Conference on Environment, Chemistry and Biology 29-30 December 2012; pp. 192-197. activities of 2018, 7, on the extracts from 2971-2978.
- [29]. Ogunbinu, A.O.; Flamini, G.; Cioni, P.L.Nigeria. *Nat. Prod. Commun.* 2009, 4, 573-578. [CrossRef]
- [30]. Okigbo, R.; Omodamiro, O. Antimicrobial effect of leaf extracts of pigeon pea (*Cajanus cajan* (L.) Millsp.) pathogens. *J. Herbs Spices Med. Plants* 2017, 12, 117-127. [CrossRef] of antioxidant activity of *Cajanus cajan* and *Pisum sativum*..)
- [31]. *Oleifera* Lam., *Heliotropium indicum* L. and *Bidens pilosa* L. from Qi, X.-L.; Li, T.-T.; Wei, Z.-F.; Guo, N.; Luo, M.; Wang, W.; Zu, Y.-G.; Fu, Y.-J.; Peng, X. Solvent-free microwave extraction of essential oil from pigeon pea leaves [*Cajanus cajan* (L.) Millsp.] and evaluation of its antimicrobial activity. *Ind. Crops Prod.* 2014,
- [32]. Oluwole, O.B.; Nicholas-Okpara, V.A.N.; Elemo, G.; Adeyoju, O.; Ibekwe, D.; Adegboyega, M.O. Medicinal uses, nutraceutical potentials and traditional farm production of Bambara beans and Pigeon pea. *Glob. J. Epidemiol. Public Health* 2021, 6, 41-50. Pal, D.; Sarkar, A.; Gain, S.; Jana, S.; Mandal, S. CNS depr...
- [33]. Orni, P.R.; Ahmed, S.Z.; Monefa, M.; Khan, T.; Dash, P.R. Pharmacological and phytochemical properties of *Cajanus cajan* (L.) PubMed]
- [34]. Pande, S.; Sharma, M.; Mangla, U.N.; Ghosh, R.; Sundaresan, G. *Phytophthora* blight of Pigeonpea [*Cajanus cajan* (L.) Millsp.]: An updating review of biology, pathogenicity and disease management. *Crop Prot.* 2011, 30, 951-957. [Cross Ref] 9.
- [35]. Patel, N.K.; Bhutani, K.K. Pinostrobin and *Cajanus* lactone isolated from *Cajanus cajan* (L.) leaves inhibits TNF- α and IL-1 β production: In vitro and in vivo experimentation. *Phytomedicine* 2014, 21, 946-953. [CrossRef] [PubMed] 20 of 20 2,37-47.
- [36]. Pratima, H.; Mathad, P. Antibacterial activity of various leaf extract of *Cajanus cajan* L. *Bioscan* 2011, 6, 111-114. 61. 62. Oyewole, O.; Owoseniand, A.; Faboro, E. Studies on medicinal and toxicological properties of *Cajanus cajan*, *Ricinus communis* and *Thymus vulgaris* leaf extracts. *J. Med. Plants Res.* 2010, 4, 2004-2008.
- [37]. Rinthong, P.-O.; Maneechai, S. Total Phenolic Content and Tyrosinase Inhibitory Potential Millsp. *Pharmacogn. J.* 2018, 10, s109-s112. Hu, Y.; Qiu, S.X. A new isoprenylated flavanone from *Cajanus caja*
- [38]. Rosa Ferreira, O.O.; Cruz, J.N.; de Moraes, Á.A.B.; de Jesus Pereira Franco, C.; Lima, R.R.; Anjos, T.O.d.L.D.d.; Cascaes, M.M.; de Oliveira, M.S. Essential Oil of the Plants Growing in the Brazilian Amazon: Chemical Composition, 2022, 27, 4373. [CrossRef] [PubMed] Applications. *Molecules*
- [39]. Sameer Kumar, C.; Satheesh Naik, S.; Mohan, N.; Saxena, R.K.; Varshney, R.K. Botanical description of pigeonpea [*Cajanus cajan* (L.) Millsp.]. In the Pigeonpea Genome; Springer: Berlin/Heidelberg, Germany, 2017; pp. 17-29. 8.
- [40]. Saxena, K.B.; Vijaya Kumar, R.; Sultana, R. Quality nutrition through pigeonpea-A review. *Health* 2010, 2, 1335-1344. [CrossRef]
- [41]. Schuster, R.; Holzer, W.; Doerfler, H.; Weckwerth, W.; Viernstein, H.; Okonogi, S.; Mueller, M. *Cajanus cajan*-a source of PPAR γ activators leading to anti-inflammatory and cytotoxic effects. *Food Funct.* 2016, 7, 3798-3806. [CrossRef] [PubMed]
- [42]. Semwal, P.; Kapoor, T.; Anthwal, P.; Sati, B.; Thapliyal, J. *Pharm. Sci. Rev. Res.* 2014, 25, 69-79. M.A.M.; and neurodegenerative disorders. *Int.*
- [43]. Sharma, S.; Singh, A.; Singh, B. Characterization of in vitro antioxidant activity, bioactive components, and in pigeon pea (*Cajanus cajan*) as influenced by germination time and temperature. *J. Food Biochem.* 2019, 43, e12706. [CrossRef] [PubMed] A. Herbal extract as potential modulator and drug for synaptic plasticity
- [44]. Singh, S.; Mehta, A.; Mehta, P. Hepatoprotective activity of *Cajanus cajan* against carbon tetrachloride induced liver damage. *Int. J. Sci.* 2011, 3, 146-147. Series: Pharm. Pharm. in Hepatotoxic Rats. In Proceedings of the IOP Conference

- [45]. Tungmunnithum, D.; Hano, C. Cosmetic potential of *Cajanus cajan* (L.) millsp: Botanical data, traditional uses, phytochemistry and biological activities. *Cosmetics* 2020, 7, 84. [CrossRef] 18 of 20 Huth.(Fabaceae): A review. *Int. J. Pharm. Sci. Res.* 2018, 3, 27-37.
- [46]. Wang, Y.; Zhao, Y.; Liu, X.; Li, J.; Zhang, J.; Liu, D. Chemical constituents and pharmacological activities of medicinal plants from genus. *Chin. Herb. Med.* 2022, 14, 187-209. [CrossRef] ; Siqueira, G.M.; Nascimento, 58, 322-328. [Cross Ref]
- [47]. Wei, Z.-F.; Jin, S.; Luo, M.; Pan, Y.-Z.; Li, T.-T.; Qi, X.-L.; Efferth, T.; Fu, Y.-J.; Zu, Y.-G. Variation in contents of main active components and antioxidant activity in leaves of different pigeon pea cultivars during growth. *J. Agric. Food Chem.* 2013, 61,] [PubMed]
- [48]. Wei, Z.-F.; Luo, M.; Zhao, C.-J.; Li, C.-Y.; Gu, C.-B.; Wang, W.; Zu, Y.-G.; Efferth, T.; Fu, Y.-J. UV-induced changes of active components and antioxidant activity in postharvest pigeon pea [*Cajanus cajan* (L.) Millsp.] leaves. *J. Agric. Food Chem.* 2013, 61, PubMed] 10002-10009. [CrossRef 1165-1171. [Cross Ref] [of Extracts from *Cajanus cajan* (L.)
- [49]. Winifred, O.; Emeka, I.E. Protective Effect of *Cajanus cajan* Earth and Environmental Science, Ogun, Nigeria, 18-20 June 2019; p. 012023. Bernadette, Y.; Amadou, T.; Aziz, T.A.; Siaka, D.; Hamidou, T.H.; Gaston, B. Seed dore, G.B.;
- [50]. Yuniastuti, E.; Primanita, S.E.; Delfianti, M. Karyotypic analysis of Pigeon pea (*Cajanus cajan* L.). *IOP Conf. Ser. Earth Environ. Sci.* 2021, 637, 012094. [Cross Ref]
- [51]. Zhang, N.; Huang, R.; Zhu, Y.; Fu, M.; Cai, J.; Yang, J.; Xu, Z.; . *Chem. Nat. Compd.* 2014, 50, 438-439. [CrossRef] , Z. Evaluation of the phytochemical characteristics and
- [52]. Zhao, J.; Li, C.; Wang, W.; Zhao, C.; Luo, Manticancer agent cajanol, isolated from pigeon pea (*Cajanus cajan* [L.] Millsp.). *J. Appl. Microbiol.* 2013, 115, 102-113. [CrossRef]