International Journal of ChemTech Research
CODEN (USA): IJCRGG, ISSN: 0974-4290, ISSN(Online):2455-9555
Vol.13 No.03, pp 251-256, 2020

Pharmacology Properties of *Cicer arietinum* L.

Xiren Guli Keyimu*[1], Magfiret Abduveli Bozlar[2], Aini Wulamujiang[3]

[1]Medicinal and Aromatic Plants Program, Hamidiye Health services vocational school, university of health sciences, Turkey

[2]Department of Public Health, Hamidiye International School of Medicine, university of health sciences, Turkey

[3]Medical Laboratory and Techniques, Hamidiye Health services vocational school, university of health sciences, Istanbul, Turkey

Abstract : Food legumes are crops of the family Leguminosae, also called Fabacae. They are mainly grown for their edible seeds and thus are also named grain legumes. Based on world production estimates, Cicer arietinum L. (Chickpea) is the third most important coldseason food legume after the common bean (Phaseolus vulgaris L.) and pea (Pisum sativum L.). Chickpea is generally consumed as a seed food, being a good source of protein and other essential human nutrients. Chickpea (Cicer arietinum L.) has recently been shown to have antioxidant, antibacterial, anticancer and antidiabetic activities. This article presents information on the chemical components of Chickpea (Cicer arietinum L.), antioxidant, antibacterial and anticancer compounds are reviewed in relation to potential medicinal uses.

Keywords : Cicer arietinum, constituents, pharmacology.

Introduction

Chickpea (Cicer arietinum L.) is currently cultivated in tropical, subtropical, and temperate regions of many countries. It is a nutrient rich ancient crop. Based on the statistical database of the Food and Agriculture Organization, chickpea is ranked fifth in terms of production and fourth on the basis of harvested area in the world among legumes [1]. Chickpea has high content of protein (16.4-31.12%) and carbohydrate, vitamins and minerals (i.e., Ca, Mg, Zn, K, Fe, and P) [3]. Chickpea has good quality of protien compared to other legumes

DOI= http://dx.doi.org/10.20902/IJCTR.2019.130322

such as green gram, black gram (Vigna mungo) and pigeon pea (Cajanus cojan) [2]. two types of chickpea are exist, they are macrosperma (kabuli) and microsperma (desi). Kabuli seeds are usually large, light-colored, smoothly coated, and have a ram-head shape, it is cultivated principally in the Mediterranean Basin, Near East, and the Americas. Desi seeds are small, angular, yellow-to-black in color, and have rough surface. The desi chickpea is cultivated mostly in India, Pakistan, and East Africa [4,5,6].

Chickpea (Cicer arietinum L.) have been used as a flour (besan) to make bread and used to prepare sweetmeats, It have been used as animal feed in many developing countries. Canned fermented, boiled, or puffed and roasted chickpeas are also available in Latin America and Turkey [2]. Besides, chickpea can maintenance of soil fertility in dry areas [7, 8].

Chickpea (Cicer arietinum L.) in Turkey:

Turkey is one of the most important chickpea-producing countries worldwide and ranks first in the Mediterranean region in terms of chickpea growing area (about 40% of total cultivation) and total chickpea production (about 50% of total agricultural production) [9]. Several legumes are caltivated and consumed in Turkey, chickpea is among the major food legume crop and it is the important source of dietary protein. Previous studies reported that domesticated kabuli chickpea bring along the Near East from wild chickpea (C. reticulatum L.), in the area that included modern-day Southeastern Turkey and adjoining parts of Syria [10]. Chickpea is widely used in the local diet and in traditional farming practices. for that reason, there are diverse chickpea germplasm and a few species of wild chickpea[11].

Previous studies examined of 11 different kabuli chickpea landraces from Turkey, using two cultivars (_Inci and_Izmir-92) as controls. All landraces were grown under the same agroclimatic conditions to eliminate variance caused by genotype 9 environment interactions. There was high diversity among the landraces in the contents of protein (17.55–23.31%), fat (4.45–6.11%), ash (2.54–3.41%), fiber (2.03–4.18%), starch (41.76–49.07%), moisture (6.39–10.57%). Ertürk et al [12]. reported that export of chickpea quantity increased by 6.88 times, value by 10.34 times. During this time, in Turkey, chickpea production has increased because of expansion of the planting area. The chickpea production is being cultivated many area in Turkey such as Antalya, Uşak, Konya, Karaman, Mersin, Kırşehir, Kütahya, Yozgat, Ankara, and Isparta provinces.

Antioxidant properties:

Chickpea is well-studied for its physicochemical composition and nutritional values and is a cheap source of high quality dietary protein, low digestible starch, minerals and trace elements [13,14,15,16].

This article evaluated free radicals scavenging, antioxidant properties and intestinal α-glucosidase inhibitory activity in methanol extract of two varieties of *Cicer arietinum* Linn viz. Bengal gram and Kabuli chana and green gram (*Vigna radiata* Linn. Wilczek) raw grains and their sprouts and examined their effect on starch-induced postprandial glycemic excursion in rats. They are concluded that Sprouting leads dynamic changes in free radicals scavenging potentials and antioxidant activities in grains. Consumption of seeds as well as BGs before the starch-rich meal can significantly mitigate 1st 30 min postprandial glycemic excursion and reduce 2 h postprandial glycemic burden[17].

Legume seed sprouts are well liked foods in globally. It is also notified that seed priming increase the antioxidant enzymes activity which reduce the adverse effects of Reactive Oxygen Species (ROS)[18].

Many antioxidants can be obtained from food sources such as sprouted grains, fruits and vegetables. Consumption of high amounts of antioxidant substances may have a positive impact on human health, particular the prevention of cancer and inflammatory diseases [5]. Seeds of Cicer arietinum are one of the ancient and widly consumed legumes in tropical and subtropical countries. Chickpeas are a rich source of zinc, folate and protein. They are also very high in dietary fiber and hence a healthy source of carbohydrates for persons with insülin sensitivity. They can assist in lowering of cholesterol in the bloodstream and are effevtive in conditions like anemia, digestive system disorder, painful menstruation, skin and hair disease and sexual dysfunction. The extent of free radical scavenging properties and antioxidant effects of crude extracts of sprouted Cicer arietinum (Chick pea/Chana/Bengal gram) seeds were evaluated. In there study two main varieties of Cicer arietinum

seeds viz. Kabuli-chana (cream seed-coat) and Bengal gram (Brown seed-coat) were examined and compared for their free radical scavenging properties and antioxidant effects. The results showed that the two Cicer arietinum extracts differed in their capacities to quench or inhibit DPPH, hydrogen peroxide and lipid peroxide. Brown colored Cicer arietinum sprouts showed the greatest activity against DPPH radicals, hydrogen peroxide radicals and lipid peroxide compared to the cream variety [18].

The plant Cicer arietinum Linn. belonging to family Fabaceae, largely cultivated in most parts of India. Seed is aphrodisiac, anthelmintic, tonic, enriches the blood, cures skin diseases, inflammation; more especially of ear, diuretic, halitosis, hepatosis, otitis, pharyngosis, pulmonosis and splenosis, Ingredient of a Unani anti-hypertensive drug Ajmaloon. Ingredient for preparation of Nakhud. Acid exudation is astringent and useful in dyspepsia and constipation. Leaves are sour, astringent, improves taste and appetite, cures bronchitis, causes flatulence. Tart leaves are orexigenic, enterosis. Isoflavonoids isolated from Cicer arietinum shows antifeedant activity. Biochanin-A and formononetin isolated from Cicer arietinum were evaluated for management of diabetes mellitus. Pangamic acid isolated from aqueous extract of Cicer arietinum has been evaluated for stamina building, antistress, antihyperlipidimic activity. The aqueous seed coat extract exhibited diuretic activity [19].

Antihyperglycemic activity:

The objective of the present investigation was to evaluate antihyperglycaemic activity of petroleum ether extract of Cicer arietinum (PEECA) seeds at three different doses i.e. 100,200 and 400 mg/kg p.o. in alloxan (70 mg/kg i.v.) induced diabetic mice. The acute oral toxicity was performed which indicated no mortality upto 5000 mg/kg p.o. dose of PEECA. In both acute and subacute studies serum glucose level (SGL) was measured.The change in body weight was noted during subacute study. OGTT was performed in both diabetic and non-diabetic mice previously loaded with (2.5 g/kg p.o.) glucose.Glyburide (10 mg/kg) was used as a standard drug. The maximum reduction in SGL was observed in PEECA (400 mg/kg) group at 6h (137.17 mg/dl) in acute study and on 21stday (217.79 mg/dl) in subacute study respectively.In glyburide treated mice the maximum reduction in SGL was observed at 6h (194.97 mg/dl) and on 21st day (267.40mg/dl) respectively. PEECA (400 mg/kg) and glyburide (10 mg/kg) prevented loss of body weight in diabetic mice. OGTT showed increased glucose threshold in non-diabetic and diabetic mice. It is concluded that PEECA showed antihyperglycaemic activity comparable with glyburide [20].

Cicer arietinum which is most commonly called as chick pea or Bengal gram or Indian gram is an edible legume of the family Fabaceae. They are high in protein and one of the earliest cultivated vegetables; 7,500-year-old remains have been found in the Middle East [21]. Cicer arietinum is an annual, branching from the base, several stems erect, angular or winged, densely glandular-pubescent, as are also the leaves [22]. The seeds are typically colored; mostly brown somewhat angular shaped with a prominent characteristic “beak” that house the embryonic axis. Sometimes they are consumed whole as such. But most of the times, the seeds are decorticated and used [23]. The ethnomedical uses of seeds includes the treatment of conditions like hyperdipsia, burning sensation, leprosy, splenomegalopathy, pharyngitis, bronchitis, inflammation and skin diseases [24]. In current study, the desi variety seeds are taken which have a brownish seed coat over the seed [25].

Inflammation is a part of complex biological response of vascular tissues to harmful stimuli such as pathogens, damaged cells or irritants. Cicer arietinum which is generally consumed as a seed food is a good source of protein and traditionally used in pacifying the burning sensation in stomach, hepatomegali, stomatitis, inflammations, skin diseases and bronchitis. In present study, the anti-inflammatory potency of methanolic and ethanolic extracts of Cicer arietinum seeds at different doses were investigated against carrageenan and histamine induced paw edema in rats. The paw edema was measured using a digital plethysmometer. After performing the acute toxicity studies, no mortality was observed even at highest dose of 2 g/kg, p.o. So, we have selected two different doses 250 mg/kg and 500 mg/kg body weight of rats for the present study and they are administered orally. The results were analyzed by one way analysis of variance (ANOVA). Almost all the treatments of extracts showed a significicant anti-inflammatory activity when compared to control groups and with standard drug (Indomethacin 10 mg/kg. p.o). Both the methanolic and ethanolic extracts showed the dose dependant activity. Among these extracts, the methanolic 500 mg/kg and ethanolic 500 mg/kg extracts of Cicer arietinum showed maximum anti-inflammatory activity from 2nd to 5th hours. There by the findings concluded

that Cicer arietinum seeds exhibit an anti-inflammatory activity and further studies were suggested to isolate the active principles responsible for the activity [25].

Antibacterial activity

Cicer arietinum is a potent medicinal plant in the medicine systems of some of the Asian countries such as India. Traditionally it is used as antibacterial, antifungal, antipyretic, antidiarrhoeal etc. hydroalcoholic extract and its acetone and methanol fractions of the root of C. arietinum were studied for their antibacterial activity by disc diffusion method against different gram positive (Staphylococcus aureus and Bacillus subtilis) and gram negative (Escherchia coli) bacteria. It was observed that the hydroalcoholic extract and its acetone and methanol fraction showed significant activity against all the microorganisms tested here and the hydroalcoholic extract showed the highest activity(13 mm) against S. aureus [26].

It was reported that the Chickpea seed extracts showed antibacterial activity. Susceptibility testing was performed according to the Clinical and Laboratory Standards Institute (CLSI) and used an inhibition endpoint for determination of the minimum inhibition concentration (MIC). The tests were carried out by microdilution method against standard strains of E. coli, P. aeruginosa, K. pneumoniae, S. aureus, B. subtilis, and E. faecalis for their antibacterial activity using ampicillin and oflaxocin as reference standards, and against C. albicans with ketocanazole and flukonazole as reference standards for antifungal activity. Chickpea seed extracts (Cse) showed antibacterial activity against Gram-negative strains (E. coli, P. aeruginosa and K. pneumoniae) in the concentration range of 16–64 µg ml-1 but were less active (concentration of 64 µg ml-1) against Gram-positive strains (S. aureus, B. subtilis and E. faecalis) [27].

Anticancer properties:

The proliferation inhibitory effects of seed protein extract from chickpeas (Cicer arietinum L.) on cancer cell lines were studied. The chickpea water, soluble proteins from ammonium sulphate precipitates, was called R1 and R5. The anti-proliferative properties of all fractions were evaluated by MTT assay. Morphological analysis using fluorescence microscopy was performed to show the ability of the extract to induce cell apoptosis. MTT assay revealed that the protein extract fractions of R3 and R4 had strong antiproliferative properties against Hela (cervical cancer cells), MCF-7 (breast cancer cell) and Saos (Sarcoma osteogenic) at all levels of concentration (0, 25, 62.5, 125, 250, 500 µg/ml) and they were tested at different times (24, 48, and 72 h). In addition, the data further revealed that the chickpea proteins showed the greatest activity against Hela and had the lowest effect on fibroblast. The results also demonstrated that chickpea proteins can be a source of bio-active components and can also be regarded as an alternative source of a new anticancer drug [28].

Antidiabetic properties:

The chickpea (Cicer arietinum) is an edible legume of the family Fabaceae, subfamily Faboideae. They are high in protein and one of the earliest cultivated vegetables. These seeds were freshly isolated and its methanol extracts were used to check its antidiabetic activity on alloxan induced diabetic mice. Methanolic extracts of Cicer arietinum seeds exhibited significant antihyperglycemic activities in alloxan-induced diabetic mice. These extracts showed improvement in parameters like body weight and lipid profile as well as regeneration of beta cells of pancreas and so might be of considerable value in diabetes treatment [29].

It was reported that the seeds reduced postprandial plasma glucose and were useful in the treatment of diabetes(99-100). The antihyperglycaemic activity of petroleum ether extract of Cicer arietinum (PEECA) seeds was evaluated at three different doses i.e. 100, 200 and 400 mg/kg po in alloxan (70 mg/kg iv) induced diabetic mice. In both acute and subacute studies serum glucose level (SGL) was measured. The change in body weight was noted during subacute study. Oral glucose tolerance test (OGTT) was performed in both diabetic and nondiabetic mice previously loaded with (2.5 g/kg po) glucose. Glyburide (10 mg/kg) was used as a standard drug. The maximum reduction in SGL was observed in PEECA (400 mg/kg) group at 6h (137.17 mg/dl) in acute study and on 21st day (217.79 mg/dl) in subacute study respectively. In glyburide treated mice the maximum reduction in SGL was observed at 6h (194.97 mg/dl) and on 21st day (267.40mg/dl) respectively. PEECA (400 mg/kg) and glyburide (10 mg/kg) prevented loss of body weight in diabetic mice. OGTT showed

increased glucose threshold in non-diabetic and diabetic mice. Accordingly, PEECA showed antihyperglycaemic activity comparable with glyburide[30,31].

Conclusion

This review discuss the pharmacological and therapeutic effects of Cicer arietinum as promising herbal drug because of its safety and effectiveness.

References

1. FAOSTAT (2008) http://faostat.fao.org/site/567/default.aspx# ancor
2. Ercan R, Ko¨ksel H, Atli A, Dag˘ A (1995) Cooking quality and composition of chickpea grown in Turkey. Gida 20(5): 289–293
3. Zia-Ul-Hak M, Ahmad M, Iqbal S, Ahmad S, Hakoomat A (2007) Characterization and compositional study of oil from seeds of desi chickpea (Cicer arietinum L.) cultivars grown in Pakistan. J Am Oil Chem Soc 84(12):1143–1148
4. Waldia RS, Singh VP, Sood DR, Sardana PK, Mehla IS (1996) Association and variation among cooking quality traits in kabuli chickpea (Cicer arietinum L.). J Food Sci Technol 33:397–402
5. Jood S, Bishnoi S, Sharma A (1998) Chemical analysis and physico-chemical properties of chickpea and lentil cultivars. Nahrung 42:71–74
6. Gil J, Nadal S, Luna D, Moreno MT, Haro AD (1996) Variability of some physico-chemical characters in desi and kabuli chickpea types. J Sci Food Agric 71:179–184
7. Khattak AB, Khattak GSS, Mahmood Z, Bibi N, Ihsanullah I (2006) Study of selected quality and agronomic characteristics and their interrelationship in kabuli-type chickpea genotypes (Cicer arietinum L.). Int J Food Sci Technol 2:1–5
8. Krouma A (2009) Physiological and Nutritional response of chickpea (Cicer arietinum L.) to salinity. Turk J Agric For 33:503–512
9. Coskuner, Y., Karababa, E. (2003). Effect of location and soaking treatments on the cooking quality of some chickpea breeding lines. Int. J. Food Sci. Tech. 38:751–757.
10. Toker C (2009) A note on the evolution of kabuli chickpeas by induced mutations in Cice reticulatum Ladizinsky. Genet Res Crop Evol 56:7–12
11. Özer S (2010). Nutritional and physicochemical variation in Turkish kabuli chickpea (*Cicer arietinum* L.) landraces. Netherlands Journal of Plant Breeding. 175(2):237-249
12. ERTÜRK A, Gül M (2018). Analysıs of productıon and trade of chıckpea ın turkey and the world. Scientific Papers Series Management, Economic Engineering in Agriculture and Rural Development 18:2
13. Khalil AW, Zeb A, Mahmood F, Tariq S, Khattak AB, Shah H. Comparison of sprout quality characteristics of desi and kabuli type chickpea cultivars (*Cicer arietinum* L.) LWT Food Sci Technol. 2007;40:937–45
14. Bampidis VA, Christodoulou V. Chickpeas (*Cicer arietinum* L.) in animal nutrition: A review. Anim Feed Sci Technol. 2011;168:1–20
15. Alessandro A, Concha C. High legume-wheat matrices: An alternative to promote bread nutritional value meeting dough viscoelastic restrictions. Eur Food Res Technol. 2012;234:273–84
16. Singh U, Subrahmanyan N, Kumar J. Cooking quality and nutritional attributes of some newly developed cultivars of chickpea (*Cicer arietinum*) J Sci Food Agric. 1991;55:37–46
17. AK, Sahana C, Zehra A, Madhusudana K, Kumar DA and Agawane SB. Mitigation of starch-induced postprandial glycemic spikes in rats by antioxidants-rich extract of Cicer arietinum Linn. seeds and sprouts. J Pharm Bioallied Sci 2013; 5(4):270-276.
18. Tom B and Thiruselyi M. Comparison of free radical scavenging activity of two main varieties of Cicer arietinum sprouts. Int Res J Pharm 2013; 4(6): 168-170.
19. Vadnere GP, Patil AV, Wagh SS and Jain SK. In vitro free radical scavenging and antioxidant activity of Cicer arietinum L. (Fabaceae). Int J PharmTech Res 2012; 4(1): 343-350.
20. Yadav BV, Deshmukh TA, Badole SL, Kadam HM, Bodhankar SL and Dhaneshwar SR. Antihyperglycemic activity of Cicer arietinum seeds. Pharmacologyonline 2009; 3: 748-757.
21. http://www.forward.com/articles/2119/

22. Theo Holm. A morphological study of Cicer arietinum. Botanical Gazette. Chicago: The University of Chicago Press; 1920.p.446-452.
23. Wood JA, Knights EJ, Chocct M.Morphology of chick pea seeds (Cicer arietinum L.): comparison of desi and Kabuli types. International Journal of Plant Sciences. 2011; 172:632-643.
24. Warrier, Nambiyar PK, VPK, Ramankutty C. Indian Medicinal Plants: A compendium of 500 species, Vol. II. Chennai: Orient Longman Private Limited;2006. p. 70
25. Doppalapudi S, Sandya L, Reddy K C, Nagarjuna S, Padmanabha R Y and Saba S. Anti-inflammatory activity of Cicer arietinum seed extracts. Asian Journal of Pharmaceutical & Clinical Research 2012 ;5:64-68.
26. Dalal K, Ahlawat S, Munjal H and Patra A. Antibacterial activity of roots of Cicer arietinum Linn. J Chem Pharm Res 2010; 2(3): 43-46.
27. Kan A, Özçeli B, Kartal M, Özdemir ZA, and Özgen S. In vitro antimicrobial activities of Cicer arietinum L (Chickpea). Tropical Journal of Pharmaceutical Research 2010; 9 (5): 475-481.
28. Barari L, Abedian Z, Asadi A, Elmi F and Elmi MM. 2017. Anti-proliferative Effect of Chickpea Extract on Hela, MCF-7, Saos and Fibroblast Cell Lines. British Journal of Pharmaceutical Research. 15(1): 1-9.
29. Prabha ML, Renitta E, Issac R, Denny, Ravi B. 2012. Antidiabetic activity of Cicer arietinum in alloxan induced mice. Natural products an Indian journal. 8 (6) 215-222.
30. Al-Snafi AE. 2016. The medical Importance of Cicer arietinum- A review. IOSR Journal Of Pharmacy. 6 (3) 29-40.
31. Yadav BV, Deshmukh TA, Badole SL, Kadam HM, Bodhankar SL and Dhaneshwar SR. Antihyperglycemic activity of Cicer arietinum seeds. Pharmacologyonline 2009; 3: 748-757.

*****