



Antioxidant Activity of Kiwi Fruit (*Actinidia Chinensis*)

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Article History:

Received on: 14 Sep 2020

Revised on: 12 Oct 2020

Accepted on: 27 Oct 2020

Keywords:

Actinidia chinensis,
Kiwi Fruit,
Phytoconstituents,
Anti-oxidant Activity

ABSTRACT

Actinidia chinensis (kiwi fruit), also known as golden fruit, has its origin in China. All the plant parts of *Actinidia chinensis* such as fruit, leaves, vine, and root were used in food products and also used as medicine in China. The Worldwide distribution of the kiwi (*Actinidia chinensis*) is due to its Nutritional property, economic value and the presence of the various phytoconstituents such as terpenoids, quinones, flavones, phenyl proteinoids and steroids. It is also rich in antioxidant and dietary fibres which are utilized for the production of cellulose and hemicellulose. The Nutritional composition of the Kiwi fruit has distinguishing amount of vitamin C and also several other compounds such as Minerals, Vitamin E and Carotenoids and these are used to protect DNA. It has a high amount of medicinal and Nutritional value and also provides various health benefits. In traditional medicine of China, Kiwi fruit is also used in the treatment of Edema, Pyorrhea, gingivitis, Hepatitis, maintenance of blood glucose level, asthma, fight against muscular degenerative diseases and reduces the risk of blood clots and also used in Cancer treatment. Recently researchers have updated that Kiwi fruit has beneficial Physiological effect on the human body through clinical studies. It has been proven that Kiwi has Anti-Oxidant property and relieves Oxidative stress which was the Major cause of Diseases. This article is an overview of kiwi fruit, its nutritional benefits and its antioxidant effect.

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ISSN: 0975-7538

DOI: <https://doi.org/10.26452/ijrps.v11i4.3637>

Production and Hosted by

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INTRODUCTION

Most of the fruits and vegetables are found to have a significant amount of therapeutic phytoconstituent with several known biological and physiological benefits to human health. Kiwi fruit is one

of the economically important fruit because of its flavour and high content of Vitamin C, dietary fibres, minerals and metabolites. *Actinidia chinensis* commonly called "Chinese Gooseberry" / "Kiwi Fruit" has originated from Yangtze River Valley of northern China and Zhejiang province on the shore of eastern China (Huang and Ferguson, 2003). It belongs to the family Actinidiaceae. There are more than 70 known species of kiwi fruit are present, but among them, only *Actinidia chinensis* (golden kiwifruit) and *A. deliciosa* were commercially processed (Huang and Ferguson, 2003). It is a deciduous climbing vine. It is one of the 40 related species of kiwi and belongs to the genus *Actinidia* and usually discussed under the name Zhonghua mihoutao (Chinese macaque monkey peach). The word mihoutao is used for *Actinidia* species since the Tang dynasty (619-907AD).

Morphologically kiwi fruit has the fibrous, dull brownish-green skin and internally bright green or

golden flesh withholding tiny black edible seeds in it. Kiwi fruit is distinct for its soft texture and its unique flavours. Comparative studies on kiwi fruit peel and its flesh have been conducted (Alim *et al.*, 2019). The peel of kiwifruit was identified to have a high content of phenolics and flavonoids; and exerts more potent antioxidant, antibacterial and anticancer activity than its flesh.

Kiwi fruit has its breakthrough in the medical world as it is used to treat Asthma, helps indigestion, and as an immune booster. Kiwi fruit is believed to have a preventive effect against cardiovascular diseases and obesity. As it is enriched with vitamins-C, K, E, folate and potassium, it acts as an effective antioxidant. Kiwi fruit has several phytoconstituents, including triterpenoids, flavonoids, phenylpropanoids, quinones and steroids (Richardson *et al.*, 2018).

Kiwi fruit contains high levels of dietary fibres; it is often reported to have mild laxating property. Seeds of kiwi act as a natural blood thinner. This fruit also improves GI laxation and decreases lipid content in the blood. When compared to apple, banana, orange, peach, pear, grapefruit, kiwifruits have a high content of total phenolic compounds and higher antioxidant capacity and one kiwifruit can fulfil 85% of our daily ascorbic acid requirements. The presence of dietary fibres and Vitamin C, E, carotenoids and Flavonoids in kiwi fruit promotes good health (Drummond, 2013).

The review gives a clear picture of the major constituents of kiwi fruit and its beneficiary activity with respect to its biological activity. The phytoconstituents present in the kiwi fruit are listed out and briefly, explained its mechanism of action and its IC₅₀ (Half maximal Inhibitory concentration) values. A brief explanation of various studies on kiwi fruit proving its antioxidant property is given.

Geographical Source

Actinidia chinensis has its origin from China, then it was exported to New Zealand and it has widespread among various nations including Italy, USA, Japan, Australia, France, Pakistan, Spain, Iran (Huang and Ferguson, 2003). In India, it has been widely used in the northern part of nation nearby Shimla hills of Himachal Pradesh, also in Jammu and Kashmir, states of Meghalaya, Sikkim, Kerala, Uttarakhand, Arunachal Pradesh, Karnataka. In India, these bear fruits in the month of October to December. It has been grown in the various ranges of clay and sand with optimum temperature and a wide range of Kiwi fruits were enriched with sources of Iron and chlorine.

Nutrient Composition

Kiwi fruit as because of its rich nutritional and economic value they were known to be called as "King of fruits" in china. It has rich sources of various nutrients, including carbohydrates, vitamins, minerals, fatty acids protein. The skin and seeds of the kiwi fruit have the highest concentration of calcium and magnesium. The flesh of kiwi is rich in potassium. The total ATP content of *A. chinensis* is 6.2 KJg⁻¹ dry matter and approximately 44-47% of apparent digestive enzymes. Also, dextrin is 0.61, Vitamin C content is about 1.61 mg/g and it varies based on their cultivation area (Ma *et al.*, 2017; Pal *et al.*, 2015).

Chemical Constituents And Biological Activity

Some of the chemical constituents of kiwi fruit having antioxidant activity and their biological activity are listed (Table 1).

Quercetin (C₁₅H₁₀O₇)

Quercetin is one of the chemical constituents present in *Actinidia chinensis* (kiwi fruit), which is polyphenol-flavanol belongs to six subclasses of flavonoid. The name quercetin is the eponym of quercetin (oak tree). IUPAC nomenclature of quercetin is 3,3',4',5,7-pentahydroxy flavanone. It acts as a calmodulin inhibitor and inhibits both cyclooxygenase and lipoxygenase with the enzyme Quercitrinase. Quercetin prevents the damage of DNA from free radical which was proven by the experiment with ThioBarbituric Acid- Reactive Substance (TBARS) and 1,1 diphenyl 2-dinitrophenyl hydrazine (DPPH). Traditionally quercetin used for the treatment of cancer, cardiovascular diseases, polycystic ovarian syndrome (PCOS), obesity, chronic diseases, reproductive dysfunctions. Various studies indicate that quercetin is an effective antioxidant, anti-inflammatory, anti-apoptotic, anti-cancer drugs (Hunter *et al.*, 2011). Use of quercetin in the pharmaceutical industry is low because it has poor bioavailability, solubility, permeability and instability. Quercetin inhibits both 2- hydroxy estradiol and 4- hydroxy estradiol and the IC₅₀ (half maximal inhibitory concentration) value was found to be 0.9 to 1.5 μM and 0.5 to 1.2 μM. In DPPH scavenging assay, the IC₅₀ value of quercetin was found to be 0.55 μM while in ABTS+ assay, the IC₅₀ values are found to be 1.17 ± 0.23 μM (Song *et al.*, 2020).

Rutin (C₂₇H₃₀O₁₆)

Rutin is 2-(3,4-dihydroxyphenyl)-5,7-dihydroxy-3-[α-L-rhamnopyranosyl-(1→6)-β-D-glucopyranosyloxy]-4H-chromen-4-one which is a polyphenolic flavonoid also referred in various terms rutinoid, vitamin, quercetin-3-rutinoid.

Table 1: List Of Various Phytoconstituents Present In Actinidia Chinensis and Its Mechanism Of Action.

| S. No | Chemical constituents/ structure | Biological activity | Mechanism of Action with enzyme | Uses | Ref |
|-------|----------------------------------|---|--|--|---|
| 1. | Quercetin | Effective against 1.Osteoporosis 2.lung cancer 3.heart problems | 1.Acts as calmodulin antagonist. 2.Inhibits both cyclooxygenase and lipoxygenase enzyme. Acts on Quercitri-nase enzyme. | Effective against Diabetes, cataracts, hay fever, peptic ulcer, schizophrenia, inflammation, Asthma, Gout, viral infection, CFS, chronic fatigue syndrome. | (Song <i>et al.</i> , 2020) |
| 2. | Rutin | 1. Antimicrobial. 2. Antifungal. 3. Antiallergic. | 1.Inhibits transcription of HMG -CoA reductase glycerol -3-phosphate acyltransferase (GPAT). 2.Acts on the cellular oxidative enzyme. | Antioxidant, treat allergic virus or arthritis, Inflammatory conditions. | (Ganesh-purkar and Saluja, 2017) |
| 3. | Catechin | 1.Angiogenesis. 2. Extracellular matrix degradation. 3. Regulation of cell death. 4. Multi-drug resistance in cancers. | 1.Direct Mechanism - Scavenging ROS Chelating metal ions. 2. Indirect mechanism -inducing antioxidants enzyme, inhibits the pro-oxidant enzyme and producing phase-2 detoxification enzyme and antioxidants enzyme. | Antioxidant | (Bernatoniene and Kopustinskiene, 2018) |
| 4. | Chlorogenic acid | 1. Anti-inflammatory. 2. Antioxidants. | 1.Inhibition of lipids. 2.Hepatic biosynthesis. 3.Effect of CGA in key enzyme activities in lipid metabolism. | Reduces blood pressure, Anti-inflammatory. | (Naveed <i>et al.</i> , 2018; Tosovic <i>et al.</i> , 2017) |
| 5. | Ferulic acid | Skin protective. | 1.Antioxidative activity ability to form stable phenoxyl radicals. 2.These reactions catalyzed by an enzyme of xanthine oxidase and cyclooxygenase -2 enzyme. | Antioxidants, Anti-inflammatory, Anticarcinogenic, Antimicrobial, Antithrombotic Increase sperm viability, Antiviral. | (Zdunska <i>et al.</i> , 2018; Zheng <i>et al.</i> , 2020) |
| 6 | Epicatechin | 1. Increase in both insulin resistance and blood pressure. 2. Prevents the onset of type-2 diabetes and many cardiac vascular systems. | 1. Ability to interact with and neutralize reactive oxygen species (ROS) in the cell. 2. Modulates cell signalling, including the MAP kinase pathway, involved in cell proliferation. | Antioxidants, antimicrobial, anti-inflammatory, anti-tumours, Neuroprotective activity. | (Shay <i>et al.</i> , 2015; Deng <i>et al.</i> , 2016) |

Notes: ROS- Reactive Oxygen Species; MAP- Mitogen-Activated Protein; CGA- Chlorogenic acid.

The name is derived from *Ruta graveolens*, which is a plant that contains Rutin. It is glycoside containing flavonoic aglycone (without sugar molecule) quercetin along with disaccharide rutinose. Mechanism of rutin is inhibition of transcription of HMG-CoA reductase glycerol-3-phosphate acyltransferase (GPAT) and ACC and the antioxidant effect of rutin is by cellular oxidase enzyme. It has various effects on body systems such as central nervous system, endocrine system, cardiovascular system, respiratory system, reproductive system, gastrointestinal tract and has various pharmacological activity such as antioxidant, cytoprotective, vaso-protective, anti-neoplastic, neuroprotective and cardioprotective activity. Rutin is poorly absorbed in intestine microflora which is present in the lower gut. Rutin gets hydrolyzed in the gut and absorbed in the walls of the small intestine as aglycone, quercetin and sugar. The IC₅₀ value of rutin was found to be 4.708 to 19.377 μ M. In the DPPH assay and ABTS+ assay, the IC₅₀ value of rutin was found to be $5.56 \pm 0.05 \mu\text{g/mL}$ and $17.16 \pm 0.05 \mu\text{g/mL}$ (Ganeshpurkar and Saluja, 2017).

Catechin (C₁₅H₁₄O₆)

Catechin is 3,3',4',5,7-pentahydroxy flavan and it is a type of polyphenolic flavanol, flavan-3-ol catechin which are a secondary metabolite of a plant. The name comes from catechu which is the tannic juice extract of *Acacia* and catechu and it belongs to the family 'Fabaceae' also known as mimosa catechu or black catechu. Catechin regulates the gene and protein expressions in the neuron by crossing the blood-brain barrier. Catechin also influences the mechanisms of angiogenesis, extracellular matrix degradation, the regulation of cell death and multiple drug resistance in cancer and other diseases (Bernatoniene and Kopustinskiene, 2018). These are scavenging reactive oxygen species (ROS) and metal ion chelator. Catechin also performs with vitamin C and E and antioxidant enzymes such as catalase and superoxide dismutase and inhibit the pro-oxidant enzyme. It has various therapeutic activity such as anti-cancer, anti-cardiovascular, hepato-protective and neuroprotective effects. It is also effective in the treatment of diabetes and obesity. Various in-vitro, in-vivo and other physical methods show the antioxidant property of catechin. Catechin inhibits 4-hydroxy estradiol and α -glucosidase and the IC₅₀ values were found to be 5-7 μ M and 239.27 $\mu\text{g/mL}$, respectively (Bernatoniene and Kopustinskiene, 2018).

Chlorogenic Acid (C₁₆H₁₈O₉)

Chlorogenic acid is 3-(3,4 dihydroxy cinnamoyl) quinic acid or 3-caffeoyl quinic acid. It is a polyphenol

family of ester. Chlorogenic acid doesn't contain any chlorine as its name has chloro with it. In metabolic-related and genetic disorder, it increases the lipid and glucose metabolism. Chlorogenic acid has many pharmacological activities such as antioxidant, antibacterial, hepatoprotective, cardioprotective, anti-obesity, antiviral, antimicrobial, anti-hypertension, free radical scavenger and CNS stimulator. The anti-oxidative mechanism of chlorogenic acid was not fully known (Tosovic et al., 2017). The effect of chlorogenic acid in key enzyme activities in lipid metabolism.

Ferulic Acid (C₁₀H₁₀O₄)

Ferulic acid is a hydroxycinnamic acid, a plant-based antioxidant compound. In earlier times it is used as anti-ageing and for skincare. It has the ability to fight free radical and effectively increases the antioxidant activity of vitamin C and E. Nowadays ferulic acid is available as serum and supplement such as serum for anti-ageing and supplement for diabetes and pulmonary hypertension. They act against free radical and plays an important role in age-related factors, skin problem which includes age spots and wrinkles. It also acts as a preservative. The antioxidant property of ferulic acid is to treat Alzheimer's and cardiovascular diseases. The photo-protective activity is increased by combining ferulic acid with vitamin C and E. It inhibits the formation of reactive oxygen species (ROS) and has an ability to form stable phenoxyl radical and these reactions are catalyzed by the enzyme xanthine oxidase and cyclooxygenase-2. Ferulic acid inhibits α -amylase, α -glucosidase, neuraminidase and the IC₅₀ values was found to be 0.622 mg/mL, 0.866 mg/mL and 50 μ M, respectively (Zdunska et al., 2018).

Epicatechin (C₁₅H₁₄O₆)

Epicatechin is one of the catechins which is a polyphenolic compound. It has multiple effects such as lowering the blood pressure and prevents the mechanism of oxidative damage, i.e. it acts as an antioxidant; it also induces endothelial dysfunction which causes both hypertension and brain disorder. It also modifies the metabolic rate, blood contents to cross the blood-brain barrier. Epicatechin has a distinctive feature that it neutralizes reactive oxygen species (ROS) and also modifies the cell signalling which includes mitogen-activated protein kinase (MAP kinase) pathway. It acts as a preventive agent and given along with drugs for chemotherapy and radiation therapy to improve the effect. The direct mechanism is they act as a free radical scavenger and indirect mechanism as a modulator of superoxide dismutase and glutathione peroxidase. The IC₅₀ value of epicatechin when inhibiting the 4-

hydroxy estradiol and 2- hydroxy estradiol enzyme is 10 to 18 μM and 44 to 65 μM , respectively (Shay *et al.*, 2015).

Anti-Oxidant Activity

Presence of Vitamin C and fibre content in this fruit is responsible for the antioxidant activity. Actinidia, a natural proteolytic enzyme, which is a unique feature of kiwi, they breakdown protein and promotes gastric digestion. It is also very sensitive to ethylene.

Antioxidant compounds play an important role as a health-protecting factor. Antioxidant activity is defined as "a limitation of oxidation of protein, lipid, DNA and other molecules that occur by blocking the propagation stage in an oxidative chain reaction and primary antioxidant directly scavenge free radical, while secondary antioxidant indirectly prevents the formation of free radical through Fenton's reaction" (Hunter *et al.*, 2011).

Antioxidants are chemical substances that protect the cells from damage caused by free radicals. It also protects other chemicals from reacting with free radical and other reactive species from damaging oxidation reaction in the body, hence oxidation process is hampered. It reduces the risk of chronic diseases based on scientific evidences. There are different methods of determination of antioxidant activity. It involves Electron SPM Resonance and chemiluminescence which measure the scavenging activity of antioxidant and other methods which determine the resistance of lipid. The Antioxidant Activity of the Kiwi fruit studied by various in-vivo and in-vitro assay (Iwasawa *et al.*, 2011).

Extensive studies have been reported on the antioxidant activity of kiwi fruit flesh by determining the scavenging effect on DPPH and ABTS radicals, Hydroxyl ion Reducing ability, Iron Chelating capacity, Ferric reducing antioxidant power and Oxygen radical absorbance capacity assay (Huang *et al.*, 2005). Determination of Radical scavenging activities is significant to prevent the deleterious role of free radicals in various diseases like cancer, Alzheimer's, etc. DPPH is an important mechanism for screening the antioxidant activity of various phytoconstituents. Hydroxyl radicals directly interact with the DNA, thereby causing the breakdown of DNA and result in Mutation, which is the main cause of cancer. Hence, hydroxyl scavenging activity is determined for plant extracts in order to check their protective effect from free radicals.

Preparation of plant extract

Aamina alim *et al.* The peel and flesh of kiwifruit was washed properly. They are well dried, weighed and homogenized with a high-speed professional

blender and then lyophilized and are stored at -20°C . The lyophilized peel and flesh were extracted using methanol under vacuum.

Ramesh *et al.* the kiwi fruit pulp was homogenized in 25mL solvent containing acetone, methanol, water and acetic acid (40:40:20:1). The homogenate was centrifuged and then filtered through a Whatman filter.

Determination of total phenolic and total flavonoid content

Aamina alim *et al.* determined the total phenolic content Folin-Ciocalteu method. The extract was mixed with 60% ethanol and 0.2N of Folin-Ciocalteu reagent. The absorbance of sample and standard (gallic acid) was checked at 760 nm. The result of Total Phenolic Content (TPC) was 9.5 and 12.8 mg gallic acid equivalent/g dry weight for the flesh and peel. Ramesh *et al.* also determined the total phenolic content by the Folin-Ciocalteu method using spectrophotometer where the sample was mixed with 200 μL of Folin-Ciocalteu reagent and the absorbance of sample and standard (gallic acid) was measured at 760 nm.

Ying Wang *et al.* determined the Total flavonoid content (TFC) using a modified colorimetric method. The extract was diluted with water and then 0.075 mL of 0.5% sodium nitrite solution was added to the diluted extract. Then, aluminum chloride was added. After 6 min, 0.5 mL of sodium hydroxide was added. The absorbance of the sample was measured immediately using a spectrophotometer at 510 nm and compared to a standard (catechin solution). Flavonoids are usually main phenolic compounds are considered as an effective antioxidant. They are abundantly present in plant source and contains maximum health benefits. Quercetin is one of the known flavonoids present in kiwifruit with the antioxidant, anti-inflammatory and antiviral property. Flavonoids are effective in chelating Cu^{2+} , Fe^{3+} and Fe^{2+} cations. Complex flavonoids are proved to be more effective superoxide radical scavengers than uncomplex flavonoids.

Radical scavenging activity of kiwi fruit towards DPPH and ABTS+

Ramesh *et al.* used various cultivators of kiwi fruit Abbot, Bruno, Allison, Hayward and Monty. The DPPH scavenging activity was done by following the procedure of Brand-Williams *et al.* 2005. The DPPH assay was determined by measuring the decrease in absorbance of methanolic DPPH solution at 515 nm in the presence of the extract. The stock solution was prepared by dissolving DPPH in methanol and then stored at 200°C for future use. The absorbance

of the peel sample was measured at 515 nm. Fruit extracts were kept undisturbed for 24 hours in the dark and absorbance was measured at 515 nm. Butylated hydroxytoluene (BHT) was used as a standard.

The radical scavenging activity towards ABTS⁺ was determined by measuring the decrease in absorbance of methanolic ABTS solution at 745 nm in the presence of the extract. The stock solution was prepared by mixing the ABTS solution with ammonium persulfate solution. The stock solutions were allowed to react for 12 h at room temperature in the dark. The solution was diluted by mixing ABTS solution with methanol and the absorbance was measured at 745. Fruit extracts (200 μ L) were allowed to react with 2000 μ L of the ABTS solution for 30 min in the dark and the absorbance was measured at 745 nm.

Various diseases like Alzheimer's diseases, Parkinson's disease, Atherosclerosis, Inflammatory diseases are linked to ROS (Reactive oxygen species) mediated damage of macromolecules because of imbalanced radical scavenging activity. ABTS⁺ and DPPH assays are extensively used to measure radical scavenging activity. Various studies used ABTS⁺ and DPPH assays to evaluate the radical scavenging activity of kiwi fruit peel and flesh. Most of the results show that both kiwifruit flesh and peel have good radical scavenging activity. But the polyphenols present in the peel extract shows much more effective free radical scavenging activity. However, the radical scavenging activity of both flesh and peel of kiwifruit are lower when compared to Vitamin C. The ABTS⁺ radical scavenging method is the best tool for determining the ability of antioxidants to prevent free radicals both in the aqueous and organic phase. High free radical quenching activities with DPPH radicals indicated that the antioxidants are having more lipids solubility (Pal et al., 2015).

Determination of total antioxidant activity

The total antioxidant activity of the methanolic extract of both peel and flesh extract of kiwi fruit was measured by phosphormolybdenum method using a spectrophotometer. Fruit extracts were combined with reagents such as sulfuric acid, sodium phosphate and ammonium molybdate. The sample was tightly closed and incubated in a boiling water bath at 95°C for 90 min. The Sample was allowed to cool at 37°C and the absorbance was measured at 695 nm. The total antioxidant activity is similar to total polyphenolic content. The antioxidative metabolites react with free radicals, mainly with peroxy radicals which is a major propagative of the fat autoxidative chain. Greater the number of hydroxyl groups in

polyphenol, greater is the antioxidant activity of the phytoconstituent (Du et al., 2009).

The kiwifruit extract showed potent activity when examining the radical scavenging activity and ferric ion chelating capacity. The extract was found to have weak reducing power between 16 and 256 μ g ml⁻¹. The IC₅₀ values for Quercetin and Vitamin C was 41.2 \pm 1.7 and 16.7 \pm 0.6 μ g ml⁻¹. TPC and TFC of the kiwi extract were determined by using Folin-Ciocalteu and aluminum chloride colorimetric assays (Huang et al., 2005).

Discussion

Various studies have examined the antioxidant activity of both peel and flesh of kiwi fruit in different in-vitro assay systems (Zuo et al., 2012). In most cases, the kiwi fruit extract showed moderate antioxidant activity, but the peel extract seemed to have more polyphenols and flavonoids which in turn have high antioxidant activity than the flesh of the fruit (Alim et al., 2019). The study illustrated that *Actinidia chinensis* peel was found to have a greater number of specific polyphenols and flavonoids, which are responsible for the higher antioxidant, antimicrobial, and antiproliferative activity when compared to the flesh of the fruit. The pericarps of *A. Chinensis* exerts much more potent antioxidant activity than the flesh. The peel extract also contains a high amount of catechin, epigallocatechin and quercetin when compared to the flesh extract. These findings prove that the peel of kiwi fruit has more antioxidant property.

Ramesh et al. examined the effect of fruit harvesting stage in October, November and December on the physicochemical and antioxidant properties in five kiwi cultivars. The results showed that with the delay in harvesting; there is an increase in pH and a decrease in Vitamin C in all cultivators. With the delay in harvesting the TPC (Total phenolic content) were decreased, while TFC (Total flavonoid content) increased in all tested cultivars (Pal et al., 2015; Wang et al., 2018). The highest concentration of the phenolic content and the flavonoid content were found in cultivator 'Allison' in the month of October and December. From this study, the antioxidant activities were found to be genotype depended and were dependent on the stage of fruit harvesting (He et al., 2019).

CONCLUSIONS

Kiwi fruits are nutrient-dense and have significant health benefits. Kiwi fruit contains Vitamin C and E, phenolics and carotenoids which is responsible for antioxidant activity and other protective mecha-

nisms. The antioxidant and protective properties of kiwi fruit promote good health. On the basis of the above study, we can clearly understand the nutritional benefits and chemical composition of *Actinidia chinensis*. The determination of antioxidant properties of kiwi fruit, mainly *Actinidia* species, was elaborately discussed. From the above review, it was concluded that most of the *Actinidia* species have moderate antioxidant activity, but the activity may differ in the various genus. The antioxidant activity of different kiwi cultivators was dependent on the stage of fruit harvesting. Comparative analysis of peel and flesh of kiwi fruit was examined and the peel of fruit was found to have potent antioxidant activity. Since it is rich in antioxidant, it was found to have various health benefits such as Asthma, indigestion, inflammation, etc. Further studies are required to prove the effect of kiwi fruit in the treatment of asthma. We are planning to develop a nano-formulation of phytoconstituents present in *Actinidia chinensis* in combination with phytoconstituents present in pepper and curcumin. Pepper and curcumin have an anti-inflammatory property and is effective in treating asthma. Further QSAR and docking studies have to be done in order to determine the protein-ligand interaction and toxicity studies.

ACKNOWLEDGEMENT

The authors are thankful to the faculty who guided us to complete this article. We are thankful to DR MGR Educational and Research Institute for providing this opportunity.

Funding Support

The authors declare that they have not received any funding for this study.

Conflict of Interest

The authors declare that they have no conflict of interest for this study.

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