Emerging epidemiological evidence is increasingly pointing to the beneficial effects of fruits and vegetables in managing chronic and infectious diseases. These beneficial effects are now suggested to be due to phenolic phytochemicals having antioxidant activity. There are many studies carried out in vitro antioxidant activities of fruits all over the world. Substantial research work has been carried out to investigate the preventive role of antioxidants in different diseases.

Stewart et al. (1991) revealed that blackcurrant and strawberry are similar in that vitamin-C, catechins and anthocyanins and they are the major contributors to the antioxidant potential.

Gardner et al. (2000) studied the relative contributions of vitamin C, carotenoids and phenolic to the antioxidant potential of fruit juices including orange, grape fruit, pink grape fruit, apple, pineapple and vegetable juices found that both vitamin concentrations and total phenolic contents strongly correlated with antioxidant capacity.

Schauss et al. (2001) evaluated the antioxidant capacities of freeze-dried acai fruit pulp/skin powder (Opti Acai) by different assays with various free radical sources. Ma et al. (2003) reported the antioxidant activity of the fruit Manilkara zapota (Sapodilla) by DPPH assay and the presence of polyphenols such as quercetin, myricitrin, gallic acid, catechin, epicatechin and gallocatechin. The studies on this fruit on anticancer activity against HCT-116 and SW-480 colon cancer cells gave a positive result.

Zhang et al. (2001) reported the antioxidant capacity and antioxidants present in hawthorn fruits. They also studied the effect of fruit extract on animal models using hawthorn as antioxidant supplements for α-tocopherol and found an increased level in the animal models.
Liu (2003) reported that fruits are especially rich in natural antioxidants and these compounds can reduce oxidative damage in the human body, which would otherwise increase the risk of chronic diseases.

Garcia-Alonso et al. (2004) evaluated the antioxidant properties of 28 fruits and also estimated the flavanol content in all those fruits which revealed that the antioxidant activity did not show correlation with the content of flavanols in the samples assayed, but this could be the result of the synergies (or antagonisms), still unknown.

Chinnici et al. (2004) reported that fruits and vegetables are the sources of natural antioxidants and among them apples have one of the highest levels of antioxidant activity.

Einbond et al. (2004) investigated the anti-oxidant activity in twelve edible fruits which includes Muntingia calabura and reported that these fruits possess strong anti-oxidant activity. He also indicated the presence of anthocyanins in Chrysophyllum cainito and Muntingia cauliflora.

Garcia-Alonso et al. (2004) evaluated antioxidant activities of grapes, plumps and apple. It was observed that white and red grapes were potent anti oxidants. Gorinstein et al. (2004) reported that the total phenol content and the antioxidative activity are higher in citrus fruit sweetie than in white grape fruits.

Kuti (2004) studied the antioxidant compounds from 4 Opuntia cactus pear fruit varieties which showed the potential value of the fruits as a good source of natural antioxidants. The high antioxidant capacity was observed in purple skinned cactus due to the high phenolic contents.

Joe et al. (2005) investigated the antioxidant activities of dried fruits both in vitro and in vivo reported that dates has the highest polyphenols among the dried fruits and suggested that dried fruits should be a greater part of diet as they are dense in phenol antioxidants and nutrients, most notably fibre.
Banerjee et al. (2005) reported the antioxidant activity of Syzygium cumini fruit in which the fruit skin has significant antioxidant activity. They also revealed that the antioxidant property of the fruit skin may come in from antioxidant vitamins, phenolics or tannins and anthocyanins.

Scalzo and Politi. (2005) reported the anti-oxidant potential by DPPH method showed high values in sample rich in polyphenols and anthocyanins, while linoleic acid degradation and hydroxyl radical quenching were better related to ascorbic acid content.

Mansouri et al. (2005) showed the antioxidant activity of date palm fruit using DPPH scavenging activity method and strong activity was observed and worked on the phenolic profile of date fruits which revealed the presence of ferulic, sinappic and p-coumaric acids and the potential antioxidant activity was expected in these compounds.

Mokbel and Hashinaga (2005) reported the antioxidant activities of banana fruits peel using DPPH method, β-carotene, linoleate model system and ferric thiocyanate methods.

Cevallos-Casals et al. (2006) studied on 14 red fleshed plum (Prunus salicina) and 8 peach (Prunis persica) genotypes for their total phenolic, anthocyanin and antioxidant activity. The results revealed a positive between phenolic compounds and an antioxidant activity for both types of fruits. Artanti et al. (2006) in his work on Star fruit isolated a compound and concluded that it is a flavonol glycoside, quercetin, which is an active antioxidant with IC\(_{50}\) value of 5.19µg/ml.

The LDL anti-oxidant activity of Mulberry was investigated and it was observed that the Mulberry possessed strong activity (Katsube et al., 2006). Fourteen tropical fruits from South Florida were evaluated for antioxidant activity, total soluble phenolics, total ascorbic acid, total dietary fibre and pectin by Mahattanatawee et al. (2006) at which the antioxidant activity showed high correlation with total soluble compounds and low with ascorbic acid.
Raffo *et al* (2006) studied seasonal variations in anti-oxidant components in cherry tomatoes. Thaipong *et al*. (2006) reported the antioxidant activity of guava fruit extracts and comparison was made in different antioxidant assays like ABTS, DPPH, FRAP and ORAC in which FRAP technique showed the highest reproducibility. They also reported that ascorbic acid and phenolics are the major contributors to antioxidant activity in guava fruit.

Zhao *et al*. (2006) reported in his work on Lychee fruit pericarp that the major flavonoids present in the ethylacetate fractions were proanthocyanidin-B₄, proanthocyanidin-B₂ and epicatechin, exhibited a strong antioxidant activity.

Abeysinghe *et al*. (2007) revealed the presence of bioactive compounds and antioxidants capacity in 4 citrus species. The different edible tissues of Citrus fruit types contained significantly higher amounts of total phenolics, total flavonoids, 2 flavanones and higher antioxidant activity than did the others.

In a study on ‘Limoncella’ apple, significantly higher levels of total phenolics and total flavanoids were detected in the skin of apples and the correlation coefficient between total phenolics and DPPH radical scavenging activity was found to be higher by Abrosca *et al*. (2007).

Hagen *et al*. (2007) investigated the antioxidant capacity (ORAC assay), phenolic compounds and ascorbic content in apple fruits which revealed the level of total phenols, ascorbic acid and antioxidant capacity was higher in the peel than in the flesh of the apples and also the presence of anthocyanins and quercetin glycosides in apple peel only, where as epicatechin, procyanidins, phloridzin and chlorogenic acid were found in both peel and flesh of the apples.

Orak (2007) reported in his research on Red grapes that there was strong correlation between antioxidant activity and phenolic content than antioxidant activity and anthocyanin content. He also revealed that anthocyanin and phenolic compounds either alone or in combination are responsible for the antioxidant in grape cultivars. The findings of Semiz and Sen (2007), clearly demonstrated the anti-oxidant and chemoprotective activities of *M. charantia* in experimental rat models.
Arancidia-Avila et al. (2008) reported in their work on Durian fruit that it is preferable to consume ripe fruit which has higher content of bioactive compounds and possess higher antioxidant capacity than the mature and over ripe fruits. He also reported about the antioxidant capacity of tropical fruits in which the results were obtained in the decreasing order: ripe Mon Thong Durian > Snake fruit > Mangosteen > Lichi > Guava > Mango.

Jensen et al. (2008) reported the major polyphenol compounds including anthocyanins, pro-anthocyanidins and phenolic acids, along with anti-oxidant capacities measured by ORAC in anti-oxidant rich fruit and Berry juice Blend. The juice blend also showed anti-inflammatory effects in several in vitro assays using inflammatory PNM cell.

Wang et al. (2008) studied the in vitro and in vivo anti-inflammatory activities of fruits of Lindera erythrocarpa. They isolated a compound lucidone and confirmed the anti-inflammatory activity was because of lucidone compound. Huawang et al.(2008) investigated the in vitro and in vivo antioxidant activity of aqueous extract from Choerospondias axillaris fruit and reported the antioxidant activity by DPPH assay, hydroxyl radical and hydrogen peroxide scavenging assays. The also reported the presents of higher amount of flavonoid and phenolic contents in the fruit extracts.

The antioxidant activity, phenolilc compound identification and nutritional quality of different strawberry genotypes were investigated by Tulipani et al. (2008), which revealed that Strawberry represents one of the most important sources of bioactive compounds with antioxidant activity together with other berries. It was also reported that flavanoids did not significantly contributed to the total antioxidant capacities of Strawberries.

Zhang et al. (2008) on their investigations on Strawberries revealed the presence of antioxidant activity using TEAC assay and also contain multiple compounds which contribute to their biological properties. They also suggested that consumption of Berry fruits including Strawberries may have beneficial effects against
oxidative stress mediated diseases such as cancer, since antiproliferative properties of some cancer cell were studied using Strawberries.

Atawodi et al. (2009) on his investigations on African variety of Dacryodes edulis (G.Don) H.J Lam fruit reported that strong antioxidant potential was observed is consistent with the polyphenol profile: ellagic acid and some of its derivatives. In addition, the combination of quercetin, ellagic acid and some other flavanoids in D.edulis fruit has been credited with health promoting potential. Alothman et al., (2009) in his work on different fruits of Honey Pineapple, Banana and Guava reported that the recovery of phenols was dependent on the fruit type and the solvent system used, he also revealed that higher the total phenolic content of the fruits, the higher were the FRAP and DPPH values. He found that the phenol content, flavonoid content and antioxidant capacity were higher in seed less Guava (Among the three fruits).

The antioxidant activity of Lagenaria siceraria fruits were analysed by DPPH assay and established a minor differences in antioxidant properties and chemical profiles between fresh and dried fruit extracts by Erasto and Mbwambo (2009). Hanachi and Golkho (2009) reported the antioxidant activity of Berberis vulgaris fruit by TBA method which shows the highest activity. Statistically significant differences (P<0.05) were observed in respect of the free radical scavenging capacity of most investigated crane berry cultivars (Borowska et al., 2009).

Azrina et al. (2010) reported the antioxidant properties of Canarium odontophyllum fruit by β-carotene bleaching method, FRAP assay, DPH radical scavenging activity, OH scavenging activity assay.

Gayathri et al. (2010) reported the strong antioxidant activity of the methanolic extract of both fruit and bark of Helicteres isora. They also reported that the fruit extract can prevent cells against oxidative damage and toxic effects of reactive oxygen species and control several diseases.

Guleria et al. (2010) reported the free radical scavenging activity and antioxidant potential of acetone extracts of Terminalia bellerica Roxb fruit, which...
showed DPPH radical scavenging activity, higher reducing power and, chelating ability. The higher phenolic content and the flavanoid content were also obtained. The phenolic contents were correlated with antioxidant activity which was higher, were as the flavanoid content was correlated with antioxidant activity which was lesser correlated, thus the report reveals that the principal antioxidant molecules in *Terminalia bellerica* fruit are non-flavanoid polyphenolic compounds.

The investigations of Naskar *et al.* (2010) suggests that hydro methanolic extract of *Phoenix dactylifera* fruits shows good antioxidant activity, reducing power, free radical scavenging activity and hepatic protection. The phytochemical screening reveals the presence of flavonoids, saponins, tannins and steroids. He also reported the antioxidant potential may be due to the presence of these phytoconstituents and vitamin C. A Chilean wild Black berry fruit, *Aristotelia chilensis* (Mol) Stuntz belongs to Elaeocarpaceae family was investigated for its antioxidant activity and phytochemical profiles which was reported to contain antioxidant that can inhibit lipid peroxidation and they have high phenolic content. The flavonoids, phenolic, anthocyanins and proanthocyanins were isolated and identified from this fruit reported by Cespedes *et al.* (2010).

Verma *et al.* (2010) investigated the antioxidant properties of green fruit of *Ficus glomerata* both in vitro and in vivo models, which proved the presence of antioxidant activity and the protective activity against DNA damage in animal models.

Jamuna *et al.* (2011) investigated the antioxidant activity in 11 different fruits, which revealed that *Phyllanthus emblica* exhibited highest antioxidant activity among the various fruits studied.

**REFERENCES**


### Studies on Antioxidant and Pharmacological activities of Muntingia calabura Linn. (Elaeocarpaceae) fruits


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