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Therapeutic properties of pumpkin

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Abstract
The pumpkin, a well-known edible plant that is a member of the Cucurbitaceae family, has long been utilised as a functional food and a herbal remedy. Pumpkins include a wealth of phytoestrogens, unsaturated fatty acids, and vitamin E in their seeds that may have medicinal, nutritional, and cosmetic benefits. In recent years, knowledge of the nutritional benefits and medicinal uses of pumpkin seeds has grown significantly, and the three primary aspects of pumpkin seeds that were previously discussed are the topic of this study. The main component of pumpkin seeds is a variety of unsaturated fatty acids, which may help prevent disease and improve health. Secoisolariciresinol and lariciresinol, two crucial phytoestrogen chemicals found in pumpkin seeds, exhibit estrogen-like effects such as reducing hyperlipidemia and osteoporosis. Usually regarded as industrial waste, pumpkin seeds (Cucurbita sp.) from the Cucurbitaceae family are discarded. Although only for household use, seeds can be used raw, boiled, or roasted in some regions. Due to their wealth. They may be essential for the food industry since they include protein, fibre, PUFA (polyunsaturated fatty acids), phytosterol, vitamins, and minerals including iron, zinc, calcium, magnesium, manganese, copper, and salt. As a byproduct of the pumpkin fruit, the seeds are less expensive and their use in various food items may increase their nutritious content while lowering the cost. It is known that pumpkin seeds have positive health effects on blood sugar, cholesterol, immunity, liver, gallbladder, leaning difficulties, prostate gland, depression, inflammation, cancer treatment, and parasite inhibition. Therefore, additional research and studies should be planned to examine the significance and positive effects of pumpkins and their seeds. The transformation of these agroindustrial waste products into valuable elements is probably a huge step towards the direction of the universal efforts in food sustainability.

Keywords: Pumpkin seeds, therapeutic properties, diabetes, anti-carcinogenic, phenols and flavonoids

1. Introduction
Natural products have been utilized as functional and nutraceutical foods for ages. In recent years, researchers have focused on unravelling the molecular influences of several nutrients on a number of lethal and chronic illnesses. Due to a variety of nutrients that vary the molecular nature of several genes, people can adapt to changes in climatic conditions and environment. In other words, nutrients cause molecular modifications. In light of this, researchers are working to prevent and treat illnesses without the usage of drugs by using the appropriate food(s). Furthermore, research has shown that eating healthily is a sensible and affordable way to manage ailments. Scientists' interest in pumpkin has grown as a result of its nutritional profile. It is a member of the Cucurbitaceae family and is a wholesome and affordable product. Due to their low cost and eco-friendly attributes, the plants *Cucurbita pepo* L., *Cucurbita maxima* Duchesne, and Cucurbita moschata Duchesne are harvested all over the world. Due to its anti-inflammatory, antioxidant, antiviral, and antidiabetic characteristics, pumpkin is used as medicine in many nations, notably in Austria, Hungary, Mexico, Slovenia, China, Spain, and other European, Asian, and African nations (Syed *et al.,* 2019) [32].
In underdeveloped nations, dietary plants and herbal medicines have long been utilised as medicine; in recent years, their usage has increased in the United States and Europe. Several of these claims of the efficacy of traditional medicinal herbs have been supported by research conducted in the previous several decades. The focus of the researchers' attention was drawn to pumpkin due to its widespread usage in traditional medical systems as a treatment for a number of diseases (antidiabetic, antihypertensive, anticancer, immunomodulation, antibacterial, anti-hypercholesterolemia, intestinal antiparasitia, antiinflammation, and antalgic). Numerous animal model, cell culture, and clinical trial investigations intended to investigate these pharmacological properties have been sparked by substantial data from a variety of epidemiological studies regarding bioactivities. Furthermore, it was shown that processes like germination and fermentation might lower antinutritional components and

modify the pharmacological properties of pumpkin. This review will concentrate on the primary medical benefits and advancements of pumpkin and identify areas for further investigation to clarify the methods through which this chemical may lower illness risk (Calli *et al.*, 2006) [43].

2. Pumpkin seeds

Pumpkin seeds have nutraceutical, medicinal, and cosmetic qualities in abundance, with several pharmacological effects and health advantages. Recent *in vitro*, *in vivo*, and pre-clinical research have demonstrated the extraordinary biological properties that pumpkin seed oil incorporates. Additionally, it is a fantastic product that might guard against several ailments due to the high proportion of unsaturated fatty acids, sterols, and tocopherol that it includes. The extensive use of pumpkin seeds receives favourable recognition as a nutraceutical as well as an edible oil. The safety of pumpkin seeds against various organs was also examined utilising a number of techniques in addition to their potential therapeutic purposes. For instance, Schiebel-Schlosser and Friederich (1998) [42] discovered that Benign Prostatic Hyperplasia (BPH) patients receiving therapy with capsules containing 500 mg of a pumpkin seed experienced no negative effects (Lestari *et al*., 2018) [16].

Pumpkin seeds were examined for their nutritional and anti-nutritional makeup. The results revealed that the seeds had the following calorific values: moisture content (5.00%), ash (5.50%), crude fat (38.00%), crude fibre (1.00%), crude protein (27.48%), available carbohydrate (28.03%), and crude protein (27.48%). The sample has the greatest potassium (273 mg/100 g), and the least manganese (0.06 mg/100 g), according to an elemental analysis. The anti-nutritional parameters examined were phytate (35.06 mg/100 g), oxalate (0.02–0.10 g/100 g), hydrocyanic acid concentration (0.22–0.04 g/100 g), and nitrate (2.27–002 g/100 g). The outcome demonstrates that pumpkin seeds may be a useful source of nutrients if used appropriately (Elinge *et al*., 2012) [9].

Pumpkin seeds may provide health advantages, according to some research. However, no research has ever been done on the antioxidant or anti-inflammatory effects of these extracts. In order to get fractions with varying contents, four commercially available pumpkin seeds were subjected to two distinct extraction techniques. Using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging assay, the extracts were tested for their antioxidant activity as well as their inhibitory effect against lipid peroxidation caused by soybean lipoxygenase. Depending on their overall phenolic content, most extracts studied have shown evidence of radical scavenging activity, with phenolic-rich fractions exhibiting the highest activity. On the other hand, since acetone and polar lipid fractions are the enzyme's greatest inhibitors, the phenol concentration of extracts does not affect their efficacy against lipoxygenase. The health advantages attributed to pumpkin seeds may be partially explained by the chemicals found in them that have the capacity to scavenge free radicals and inhibit lipoxygenase (Xanthopoulou *et al*., 2009) [36].

3. Therapeutic benefits of pumpkin

3.1 Diabetes mellitus

According to Zhou *et al.*, (2015) [41], diabetes mellitus is one of the most expensive chronic illnesses in contemporary society. The majority of diabetics have type 2 diabetes, which is not insulin-dependent and is marked by hyperglycemia and dyslipidaemia as a result of abnormalities in insulin production and action (Huang *et al*. 2015) [41]. Edible and medicinal resources have emerged as promising candidates for novel natural compounds with hypoglycaemic and hypolipidaemic activity in light of the concomitant side effects and adverse responses of chemosynthetic medicines, such as acarbose and biguanides. Some plant polysaccharides have been shown to have hypoglycaemic properties, according to a number of studies. These polysaccharides come from Trichosanthes peel, bamboo shoots (*Leleba oldhami* Nakal) shells, *Lycium barbarum* L, loach, *Grifola frondosa*, and *Moringa oleifera* Lam. Leaves (Zheng *et al.*, 2016) [40].

Pumpkins were prepped by peeling and removing the pulp, washing with tap water, slicing, and drying in a hot air oven (JK-OOI240A, China) at 60 C for 4 hours to produce a fine powder. One litre of distilled water held 100 g of pumpkin powder. 60,000 U of commercial thermostable a-amylase were added when the pH of the solution was brought down to 6.5. The mixture was extracted for two hours at 95 C in a water bath. The extracts were concentrated to *20% (w/v), filtered using Whatman GF/A filter paper, proteins were removed using the Sevag technique, and precipitated with three volumes of pure ethanol. The precipitates were freeze dried to produce crude PPs, which were then dissolved in distilled water and run through a DEAE-52 cellulose anion-exchange chromatography column (30 cm 9 2.6 cm, GE Healthcare, UK). The column was then eluted with 0.05 mol/L PBS, and a gradient solution of 0.05-1.0 mol/L NaCl was added at a flow rate of 1.0 mL/min. The proportion that was eluted was collected for later investigations. At the conclusion of the sixth week, the mice were given glucose (2.0 g/kg body weight) orally after fasting for 12 hours. The mice's tails were clipped to take the blood samples, and serum glucose levels were measured on a OneTouch glucose monitor at 0, 20, 40, 60, 80, 100, and 180 minutes, respectively (Song *et al.*, 2017) [31].

Different *Cucurbita maxima* seed extracts were tested in wistar albino rats against streptozotocin (50 mg/kg i.p.) at doses of 200 mg/kg p.o. for 21 days to determine their anti-diabetic and anti-hyperlipidemic effects. As a reference medication, glibenclamide (500 g/kg) was employed. On days 0, 7, 14, and 21, fasting blood glucose (FBG) levels were assessed. When compared to the control, it was shown that the blood glucose concentration was considerably (P 0.05) lower. Additionally, *Cucurbita maxima* oral treatment considerably (P 0.05) lowered blood total cholesterol, LDL, VLDL, and triglyceride levels while notably raising insulin and HDL cholesterol levels. In streptozotocin-induced diabetic rats, administration of the reference medication glibenclamide likewise resulted in a substantial (P0.05) decrease in blood glucose concentration. In light of these findings, *Cucurbita maxima* is a source of powerful antidiabetic agents, has antidiabetic and antihyperlipidemic effects, and can improve the diabetic condition (Sharma *et al.*, 2013) [19].

When it comes to the pathophysiology of diabetes and its consequences, reactive oxygen species are incredibly important. This investigation will look at how Wistar rats that have been given alloxan to induce diabetes respond to a flax and pumpkin seed powder mixture. Three groups of six animals each were used: a control group (CD), a group of diabetic rats (DD), and a group of diabetic rats given a flax and pumpkin seed combination (DMS). When compared to

the control group (CD), the diabetic rats (DD) showed a significantly higher level of glycemia, plasma and liver lipid markers such total lipid, total cholesterol, and triglycerides. Malonaldialdehyde levels (MDA, a measure of lipid peroxidation) were also considerably higher in the liver and plasma compared to (CD). When compared to controls, diabetic rats' plasma and liver levels of antioxidant enzymes including catalase, superoxide dismutase, and reduced glutathione (GSH) dramatically decreased. The DMS group's diet supplemented with a flax and pumpkin seed combination improved the levels of GSH and antioxidant enzymes in diabetic rats and markedly lowered MDA levels. According to the study, aspartate aminotransferase and alanine aminotransferase activities significantly increased in diabetes condition, indicating substantial hepatic damage. The administration of a flax-and-pumpkin seed mixture reduced the elevated plasma enzyme levels brought on by the development of diabetes and led to a recovery towards normalisation that was equivalent to that of the animals in the control group. In light of these findings, it is possible that adding a flax and pumpkin seed mixture to the diet will assist adult rats avoid developing diabetes problems. (Makni *et al.*, 2011) [18].

3.2 Anti-carcinogenic properties

One of the biggest challenges to public health, both in industrialised and developing nations, is cancer. In India, colon cancer (CC) is the sixth most prevalent cause of death and the third leading cause worldwide. There are various synthetic cancer treatments available, however they have adverse effects. Investigating plant-derived anticancer medicines with fewer side effects is thus necessary. We have made an effort to explore the potential of pumpkin seed extract to treat colon cancer in this way. According to research, there was a substantial difference in the number of aberrant crypt foci (ACF) in all treatment groups as compared to the control and DMH groups. At a dosage of 200 mg/kg before treatment, the colon length/weight ratio significantly decreased in the pre-treatment group. When compared to control and DMH control, pre-treatment groups demonstrated a substantial increase in colonic glutathione (GSH) and superoxide dismutase (SOD) levels. In the treatment group 200 mg/kg, the nitrite concentration was lower at 5.2030.852 than it was in the DMH control group at 8.5063.866. In histology, all treatment groups showed decreased hyperplasia and ACF. In light of this, pumpkin seeds may lower the incidence of CC when included in a healthy diet (Chari *et al.*, 2018) [4].

The findings show that pumpkin fruit has greater levels of sugars, carbohydrates, and total proteins in addition to being a rich source of carotenoids and vitamin C. The study emphasises that fruits should be picked when they reach the point of commercial development. Consuming cucumbers aids in healing from colon and rectal cancers during or after treatment (Ceclu *et al.*, 2020) [3].

Numerous healthy elements, including phytoestrogen, selenium, fibre, cucurbitacin E, calcium, zinc, and other vitamins and minerals, are present in pumpkin. As several studies and scientific techniques have demonstrated, they are useful for treating various ailments as well as preventing cancer. This article will describe the signalling pathways and molecular mechanisms of action of certain nutrients found in pumpkin and explain their existence, their functions in preventing cancer and treating disorders. The pumpkin plant also has flowers, leaves, roots, and seeds, all of which contain therapeutic ingredients. Consequently, we may regard this productive plant as a useful therapeutic herb with certain anticancer properties (Colagar *et al.*, 2012) [7]. Retinal, Retnol, Retnoic Acid, and Retnal Esterase are examples of fat-soluble retinoids.Its primary function is in the retina's visual pigments, but it also regulates gene expression, cell differentiation, the immune system, reproduction, cellular communication, cell proliferation, and the regular development and upkeep of organisms. Human diets include two kinds of vitamin A: carotenoids (beta and alpha carotene) and functional vitamin A (retina and retinal ester). There is a link between vitamin A consumption and some malignancies including lung and prostate because vitamin A has a function in the control of cell development and differentiation. For instance, research on smokers and non- smokers revealed that consuming a lot of carotenoids is linked to a lower chance of developing cancer (Colagar *et al.*, 2012) [7].

Since ages, traditional medicine has used pumpkin seeds as a treatment for problems with the kidneys, bladder, and prostate. However, the information provided by research on pumpkins is insufficient to support the prevailing theories of ethnomedical practise. The Styrian pumpkin, *Cucurbita pepo* L. subsp. pepo var. styriaca, produces seeds that were hydro-ethanolically extracted to determine their bioactivity. Since cucurbitin is the component that is standardised in pumpkin seed extracts, it was also examined. Human androgen, oestrogen, and progesterone receptor transactivational activity was assessed using *in vitro* yeast tests. Prostate cancer, breast cancer, colorectal adenocarcinoma, and a hyperplastic cell line from benign prostate hyperplasia tissue were used in the cell viability experiments. Effects on cell survivalwere examined using a human dermal fibroblast cell line (HDF-5) as a paradigm for non- hyperplastic cells. For both extract and cucurbitin, there was no transactivational activity for the human androgen receptor, oestrogen receptor, or progesterone receptor. With the exception of HDF-5, which had a cell growth inhibition of about 20%, all cell lines shown an inhibition of cell growth of between 40 and 50%. A steroid-hormone receptor independent growth inhibitory impact can be expected given the receptor status of particular cell lines. The ethnomedical usage of pumpkin seeds for treating benign prostatic hyperplasia is supported by the cell growth suppression of fast-growing cells as well as the cell growth inhibition of prostate, breast, and colon cancer cells. Additionally, prostate applications made from pumpkin seeds are considered safe due to their lack of androgenic action (Medjakovic *et al.*, 2016) [21].

The impact of phytoestrogens on hormone-dependent cancers is debatable. In this study, we looked at how the pumpkin seed extract (PSE) affected the synthesis of estradiol and the ER-/ER-/PR status in MCF7, Jeg3, and BeWo cells. Mass spectrometry was used to produce and analyse the PSE. Different PSE doses were treated with MCF7, Jeg3, and BeWo cells. Cells left untreated served as controls. Using the ELISA technique, supernatants were examined for the synthesis of estradiol. Furthermore, immunocytochemistry was used to evaluate how the PSE affected the expression of

ER-/ER-/PR. Both lignans and flavones were discovered to be present in the PSE. In MCF7, BeWo, and Jeg3 cells, the synthesis of estradiol increased in a concentration-dependent way. considerable ER-downregulation and considerable PR overexpression were seen in MCF7 cells. The results from the aforementioned animal experiments suggest that the lignans in pumpkin seeds may play a role in the prevention and/or treatment of breast cancer (Richter *et al.*, 2013) [28].

Polyphenols and other bioactive substances that may function as chemopreventive agents against cancer are abundant in pumpkin seeds. This study examined the effects of five different pumpkin seed extracts on the proliferation and autophagy of PC-3 prostate cancer cells. Cell growth was decreased by all extracts (water [W], methanolic, acetone, ethylacetate, and polar lipid [PL]) in a dose-dependent way. While PL and W extracts dramatically promoted autophagy, treatment with the PL extract increased cell dispersion in the S phase. Additionally, PL extract caused a notable rise in glutathione and oxidised glutathione levels, but did not affect nitrite or hydrogen peroxide levels. The effects of pumpkin seed extracts on PC-3 cell survival, oxidative parameters, and the autophagic pathway show that they may have therapeutic applications (Nomikos *et al.*, 2021) [24].

3.3 Anti-ageing properties

Since natural -carotene and vitamin E (tocopherols) minimise skin damage, the ageing process, the chance of developing cataracts, and tumour growth, pumpkin offers an ideal meal whether you're trying to lose weight or protect your skin from the sun. It has been demonstrated that vitamins C, E, and beta carotene promote eye health and shield it against deterioration (Ceclu *et al.*, 2020) [3].

Carotene may be found in a variety of plants, including carrots, mangoes, papaya, and pumpkins, among others. Due to its pro-vitamin-A activity, lipid radical scavenging activity, and single oxygen quenching qualities, it has become a major carotenoid. UV-induced erythema has been observed to be prevented by beta-carotene, which also possesses great photoprotective qualities. There have been reports linking low plasma levels of -Carotene to cellular ageing. The telomerase activity of older persons may be modulated by -carotene, according to a study that involved 68 elderly participants (Dhanjal *et al.*, 2020) [8].

Particularly for males with Benign Prostate Hypertrophy (BPH), pumpkin seeds have some distinct prostate health advantages. The oil found in pumpkin seeds may aid in reducing hormone-induced prostate cell proliferation. After age 50, BPH is a disorder that typically affects males. It involves the prostate gland enlarging. An enlarged prostate is at danger due to advanced age. Over stimulation of the prostate cells by testosterone and its conversion product, dihydrotestosterone (DHT), is one of the factors that lead to BPH. In the prostate, DHT accumulates and promotes prostate growth. According to studies, pumpkin seeds contain defensive substances called phytosterols that aid in prostate reduction. The effects of DHT on the prostate are lessened by the polyphenols in pumpkin seeds. Additionally, this could prevent the formation of DHT from testosterone. Studies are also being conducted to determine the possible prostate health advantages of the carotenoids and omega-3 fatty acids present in pumpkin seeds. The significance of pumpkin seeds in promoting the prostate may be influenced by the fact that they are an excellent source of zinc (George *et al.*, 2019) [10].

Pumpkin seeds are a wonder of health. They may be small, but they’re mighty in mood- boosting benefits. As well as being a good source of protein and omega-6, pumpkin seeds also contain tryptophan and magnesium, which can improve sleep. It is no secret that sleeping better can-do wonders for our mood. The tryptophan in pumpkin seeds can also help to produce serotonin5, a mood-boosting neurotransmitter. Researchers and physicians from all over the world are interested in the connection between diet and the impact on skin ageing. Human intervention studies have shown the potential for influencing and postponing skin ageing and enhancing skin conditions by dietary supplementation with particular nutritional elements. An ever-increasing interest in the creation of dietary supplements and food items with functional properties to improve human skin has been sparked by new insights into the impact of orally administered biologically active molecules on skin processes. The notion of photoprotection has garnered prominence recently as the cornerstone of skin-protective techniques and a workable strategy to limit the occurrence of photo ageing. The prevention of skin ageing is of continually growing relevance to the general public. The potential impact of nutrition on the skin's ability to fend against UV radiation damage has been the subject of several research. The qualities of a few intriguing antioxidants that have gained attention for their anti-aging and protective actions (Marini *et al.*, 2015) [20].

3.4 Cardiovascular disease and obesity

Reducing obesity is a strategy to lower diabetes, depression, and cardiovascular disease. A beneficial plant, pumpkin offers a variety of qualities, including antioxidant, lipid-lowering, and anti-diabetic potential. This investigation's objective was to evaluate pumpkin's anti- obesity properties in rat models of diet-induced obesity. Thirty adult male Wistar rats were randomly assigned to five groups of three experimental diet-fatty rats that received hydro- alcoholic extracts of pumpkin once daily at dosages of 100, 200, and 400 mg/kg, respectively, and three healthy control groups (n=6). Lipid profile, atherogenicity, liver enzymes, and the presence of oxidative stress were assessed after 6 weeks. Triglycerides, low-density lipoprotein, and liver enzymes were all drastically reduced by pumpkin in a dose-dependent manner, whereas high-density lipoprotein was noticeably elevated in the treated groups. In compared to the control group of obese people, pumpkin also boosted glutathione level (Ghahremanloo *et al.*, 2017) [11].

In Korea, there is a long history of using pumpkin juice (PJ), corn silk tea (CT), and adzuki bean tea (AT) to cure obesity. This study looked at how well PJ, CT, AT, and their combination (PCA) affected body weight and antioxidant metabolism in rats given a high-fat diet (HFD) to make them obese. Following a 4-week HFD feeding period, SD rats were separated into six groups and given the following diets for a further 9 weeks: ND, HFD, HFD+PJ (250 mg/kg body weight), HFD+CT (250 mg/kg BW), HFD+AT (250 mg/kg BW), and HFD+PCA (PJ: CT: AT=1:1:1, 250 mg/kg BW). Administration of PJ, CT, AT, or PCA decreased the amount of total lipid, triglyceride, and total cholesterol that accumulated in adipose tissue as a result of HFD eating. In comparison to the HFD group, the plasma oxygen radical absorbance capacity value and hepatic glutathione peroxidase

activity were considerably increased. The PCA group had considerably less liver thiobarbituric acid reactive compounds than the HFD group. The comet test revealed a reduction in HFD-induced DNA damage in hepatocytes in the PJ, AT, and PCA-supplemented groups. When compared to other treatments, the PCA group had a stronger antigenotoxic impact. Plasma adiponectin concentration was restored by PCA after it had been decreased by HFD. The HFD group's adipocyte surface area (%) was considerably larger than the ND group's, significantly lower than the HFD group's in the PJ and PCA groups, and not significantly different from the ND group's. The findings showed that PJ, CT, AT, and PCA supplementation had lipid-lowering effects in the adipocytes of HFD-induced obese rats. Additionally, in all treated groups, the PCA group shown better antioxidant activity. This study raises the possibility that a mixed beverage made up of PJ, CT, and AT may be a substantial source of natural antioxidants, which may be beneficial in halting the development of different oxidative stressors brought on by HFD and avoiding obesity (Park *et al.*, 2016) [26].

Typically, wheat flour-which is high in calories but poor in fiber-is used to make cookies. When making cookies, yellow pumpkin flour can be used in place of wheat flour. An indigenous delicacy from Indonesia called yellow pumpkin has significant levels of beta carotene and fibre. This study compared the nutritional value and acceptability of cookies made using wheat flour with yellow pumpkin and coffee flour. Two formulations-Formula 1 (F1), a 1:2 ratio of yellow pumpkin flour to mocaf flour, and Formula 2 (F2), a 1:2 ratio of yellow pumpkin flour to wheat flour-were employed for this experiment. Two formulations-Formula 1 (F1), a 1:2 ratio of yellow pumpkin flour to mocaf flour, and Formula 2 (F2), a 1:2 ratio of yellow pumpkin flour to wheat flour—were employed for this experiment. A close examination of the cookies was done. The findings revealed that the yellow pumpkin and mocaf flour cookies had a total energy content of 459.71 kcal/100 g, protein content of 1.12 g/100 g, fat content of 36.35 g/100 g, fibre content of 43.59 g/100 g, and carbohydrate content of 31.94 g/100 g, whereas the yellow pumpkin and wheat flour cookies had a total energy content of 587.72 kcal/100 g. The energy value of the yellow pumpkin and wheat flour cookies was 587.72 kcal/100 g, while their protein, fat, and carbohydrate contents were 4.79 g/100 g, 21.42 g/100 g, and 50.19 g/100 g, respectively. The results of the acceptability test, which involved 25 panellists, revealed that there was no difference between the two types of cookies in terms of colour, texture, flavour, or scent (Mustika *et al.*, 2020) [22].

For newborns and kids with advanced heart failure, the Jarvik Heart, Inc., New York, NY company created the Infant Jarvik Ventricular Assist Device (VAD).

It was discovered that the first iteration of the gadget had enhanced hemolysis under specific circumstances. The goal of this research was to choose the Infant Jarvik VAD alterations that would produce hemolysis levels that would be acceptable. According to *in vitro* hemolysis tests, there is a threshold speed at which hemolysis will occur and a relationship between hemolysis and the form of the pump blade tips. A final design that achieved the hemolysis performance target was chosen after a number of design variations were evaluated. The Jarvik 2015 VAD was given to the updated version. The device's performance features were evaluated using chronic *in vivo* testing, virtual fit studies, and a number of other performance tests. The findings of several animals' *in vivo* tests confirmed acceptable hemolysis levels, and virtual fit experiments demonstrated that the device would suit youngsters 8 kg and beyond but might also fit in younger children. For the Jarvik 2015 VAD clinical study to start, further FDA- required testing has been finished, and all of the results are being submitted to the FDA. It has been difficult to develop a Jarvik VAD for use in young children for a number of reasons. However, the Jarvik 2015 VAD addresses the haemolysis issue. In the near future, the Pumpkin clinical study will begin with the device in excellent condition (Baldwin *et al.*, 2017) [1].

sA large class of chemical substances known as antioxidants are distinguished by significant bioactivity. By preventing reactive oxygen species from becoming active, they have an impact on human health. As a result, they minimise their negative effects and lower the risk of several illnesses, such as cancer, cardiovascular disease, and neurological disorders. Additionally, the food business makes extensive use of antioxidants. They stop food goods from changing negatively while being stored. They prevent fat from being oxidised and prevent colour fading. They are frequently included in meat products because of this. Numerous diet ingredients have antioxidative action. Fruit, vegetables, spices, herbs, tea, and red wine are said to have a strong antioxidative ability. The antioxidant capacities of numerous plant materials have thus far been investigated. However, there hasn't been enough research done to fully understand the antioxidative action of these products. Only a small number of research have been done to far on the antioxidative properties of pumpkin, including the seeds, flowers, and leaves but not the pulp. Our experiment's major goal was to maximize the extraction process in order to raise the pumpkin pulp's antioxidative activity. For this, several extraction conditions, such as different solvent types and concentrations, different extraction times and temperatures, were utilised. The trial also included a comparison of 14 pumpkin cultivars from the *Cucurbita maxima* species in terms of their antioxidative capability. The research revealed a significant range in the antioxidative capacity of several pumpkin cultivars (Kulczyńsk *et al.*, 2020) [15].

4. Conclusion

On the basis of the above discussed, it is concluded that pumpkin as a whole have various therapeutic properties. It has been observed that pumpkin has been used for treatment of various diseases from centuries by locals of various nationals. Pumpkin is well known for pumpkin seeds and pumpkin seed oil. The nutritional content of pumpkin seeds includes high number of phenolic compounds, flavonoids, antioxidants and vitamins which assists in the pathway of managing lifestyle diseases. Pumpkin polysaccharide has been found to help in managing diabetes naturally. Similarly pumpkin juice helps to rejuvenate skin and have anti- ageing effects. High number of vitamins and antioxidants helps in reducing tumour cell growth under carcinogenic condition. High number of antioxidants also helps in maintaining goof cardiovascular health of human being which also an extension to obesity. Hence, it is proved that regular consumption of small amount of pumpkin or any pumpkin part helps in overall improvement of health of human being.

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