3. REVIEW OF LITERATURE

Brief exploration work has been done regarding to the phytochemistry, seed treatment, proximate analysis, anti-oxidant activities, anti-diabetic activity, anti-microbial activity and infusion of bio active compound. But very little relative information was available to our work. In this work related some references are given below with prober sub titles.

Vegetables grow well on heavy soil but for carrot it is not so, unless lots of organic materials are added. In dry soils the roots of the carrots are crack but in favorable soil conditions, it produces long roots (Tindall 1983).

Carrot belongs to the family Umbelliferae and it is native of Europe and the temperate parts of Asia. It is originated from the present day Afghanistan some 5000 years ago. Today’s modern carrot is believed to have been introduced to Europe in the eighth to tenth centuries (Dalby et al., 1997).

3.1 Phytochemistry

Peter et al., (2004) suggested that phenolic make a major contribution to antioxidant activity in Tomato fruit. Fruit size was negatively correlated with anti-radical power (r= –0.74) and inhibition of lipid peroxidation (r=–0.71), indicating that combining large fruit size and high antioxidant activity will be challenging.

The fruits are mostly red but there are some other colors such as yellow. There is a lot of variation between cultivars in the size and shape of the fruits, in the thickness of the fleshy mesocarp and in the development of the placenta (Prashanth et al., 2004).
A novel terpenoid, cydonioside A (1), was isolated from the fruits of *Cydonia vulgaris*. Its structure and relative configuration were elucidated on the basis of in-depth spectroscopic analyses, including 2D-NMR experiments as well as MM3 calculations. Compound 1 was assayed for its radical scavenging activity towards the DPPH radical and the superoxide radical anion (O₂⁻), as well as for its overall antioxidant activity, as assessed by the formation of a phosphor molybdenum complex (Antonio Fiorentino *et al.*, 2007).

The methanol extracts of *Salvia macrochlamys* Boiss and Kotschy was fractionated on a silica gel column to yield a group of terpenic compounds. After separation and cleaning, seven known and three new terpenoid compounds were isolated, and their structures were elucidated by spectroscopic methods, including intensive NMR and MS studies. The crude extract was tested in five different systems for antioxidant activity (Gulact Topcu *et al.*, 2007).

Sibel Karakaya (2007) investigated lycopene content and antioxidant activity of fresh, sun-dried and canned tomatoes. The highest lycopene bioavailability was obtained for sun-dried *Lycopersicon esculentum* (58.05%) and this was followed by fresh (28.67%) and canned *L. esculentum* (21.83%). Fresh *L. esculentum* showed the highest antioxidant activity against ABTS radical oxidation.

Terpenoids (isoprenoids) encompass more than 40 000 structures and form the largest class of all known plant metabolites. Some terpenoids have well-characterized physiological functions that are common to most plant species. Historically, specialized terpenoids, together with alkaloids and many of the phenolic have been referred to as secondary metabolites. More recently, these compounds have become widely recognized, conceptually and/or
empirically, for their essential ecological functions in plant biology (Bohlmann et al., 2008).

Fikselova et al., (2008) described carotenes extraction from carrot under different conditions involving different temperatures, treatment of samples, and solvents (ethanol, 2-propanol). It was revealed that the best extraction efficiency was achieved with the samples treated by freezing and using the extraction 60°C for 2-4 hours. Higher temperatures caused an increase in the carotenoid concentrations.

Metabolic engineering of resveratrol compound has been achieved in tomato plants (Lycopersicon esculentum Mill.) in order to improve their nutritional value. The total antioxidant capability and ascorbate content in transformed fruits were also evaluated, and a significant increase in both was found in the LoxS and 35SS lines. These results could explain the higher capability of transgenic fruits to counteract the pro-inflammatory effects of phorbol ester in monocyte macrophages via the inhibition of induced cyclooxygenase-2 enzyme (Annalisa et al., 2009).

Shirani et al., (2009) included fenugreek polysaccharide for the physical and sensory quality characteristics of chickpea rice based extruded products. The incorporation of fenugreek, in the form of debittered polysaccharide was suggested up to a level of 15% in a chickpea rice blend to develop snack products of acceptable physical and sensory properties.

Toor et al., (2009) showed that a high amount of the total phenolics and total flavonoids (71-77%) were released from tomatoes during digestion. This study shows that the antioxidant components of tomatoes were affected by the in vitro digestion conditions depending on the type of compound.

Tamagnone et al., (2010) investigated to quest new potential plant protease and make it industrially applicable and cost is effective three novel
proteases were detected in tomato (*Lycopersicum esculentum* Mill.) fruit by Sodium Dodecyl Sulfate (SDS)-gelatin-polyacrylamide gel electrophoresis. These results suggested that proteases from tomato fruit had potential application in food, detergent, tannery and medical industries.

Nayeem Khatiba *et al.*, (2010) determine the gastro protective potential of the fresh juice extract of the roots of *Daucus carota*. The juice extract of the roots of *D. carota* (DCE) was tested orally at the dose of 200 and 400 mg/kg body weight, on gastric ulceration experimentally induced by pylorus ligation, aspirin and ethanol induced.

The isolation of terpenoid compounds nardal, jatamansic acid and nardin were carried out from the extract of jatamansi by fractionation. These compounds were identified based on physical and spectral data and comparison with authentic compounds (Gottumukkala *et al.*, 2011).

Bushra Afreen *et al.*, (2011) determined the physiological and cytological changes in carrot (*Daucus carota*) due to infection of cucumber mosaic virus. Regarding the physiological changes, carbon, nitrogen and protein contents was decreased in infected plants as compared to healthy plants while phosphorous content was increased in diseased plant. Chromatin bridges were also observed at anaphase I and II due to infection of cucumber mosaic virus.

The kinetics of peroxidase thermal inactivation, total phenolic content degradation, and color (redness and yellowness) and texture changes were studied in a temperature range of 70–90 _°C_ for carrots (*Daucus carota* L). To obtain a high quality carrot product a balance must be made between color and total phenolic content losses. Therefore, blanching at 80° _C_ for 6 min is suggested as a compromise condition to maximize quality (Goncalves *et al.*, 2011).
Azeez et al., (2012) showed that the highest Phenolic contents of fruits and 360mg quercetin of extract of *Lycopersicon esculentum* (unripe). Ripe *Lycopersicon esculentum* has higher lycopene and β-carotene contents than the unripe ones, but a lowest was obtained for *Capsicum frutescens* upon ripening. These fruits and vegetables can be considered as good sources of antioxidants as shown by the values obtained for antioxidant, due to the presence of phenolic, flavonoid, β-carotene and lycopene contents.

Hung et al., (2012) determined the effects of the drying methods on the bioactive compounds of the vegetables (carrot, taro, tomato, red beetroot and eggplant). A high temperature in the heat-drying method in sample preparation significantly reduced total free and bound phenolics, total free and bound flavonoids and their antioxidant capacity. The antioxidant capacity of the extracts highly correlated with free phenolic compounds ($r^2 = 0.8936$) and free flavonoid compounds ($r^2 = 0.6682$).

Jose Pinela et al., (2012) analyzed components included macronutrients, individual profiles of sugars and fatty acids by chromatographic techniques, hydrophilic antioxidants such as vitamin C, phenolics, flavonols and anthocyanins, and lipophilic antioxidants such as tocopherols, β-carotene and lycopene. Overall, these farmer’ varieties of garden tomato cultivated could contribute as sources of important antioxidants related to the prevention of chronic diseases associated to oxidative stress, such as cancer and coronary artery disease.

*Lycopersicon esculentum* (Solanaceae) were analyzed for minerals and anti-nutritional composition. The Ca/P (0.97 mg/100g) shows that the fruits to be a good source of food nutrients while the Na/K value was less than 1. The results of the study generally revealed the fruits to be rich in minerals and the anti-nutrients content (Oyetayo et al., 2012).
Isolation and characterization of a novel terpenoid from the rhizome of *Curcuma caesia* Roxb. (Black turmeric) followed by assessment of its bioactivity. Chemical characterization of the sample was done through UV, IR (FT-IR), HRMS and NMR spectroscopic techniques (Arghya Ghosh et al., 2013).

Mohammed Rafiqkhan et al., (2014) investigated to phytochemical analysis of *Lycopersicon esculentum* (flower) has been evaluated for the presence of bioactive compounds using various polarity solvents including hexane, chloroform, methanol and water. The study revealed the presence of alkaloids, flavonoids, terpenoids, phenolic compounds, sterols, carbohydrates, glycosides and tannins.

The aqueous extract of *Lycopersicon esculentum* (red tomato) was used for the rapid synthesis of Ag NP, which is very simple and eco-friendly in nature. The UV-visible spectroscopy technique was employed to establish the formation of Ag NP. It has been concluded that the nanoparticles are bacteriostatic at low concentration and bactericidal at high concentration. So these nanoparticles are believed to act as preventive for bacterial contamination (Swarnali Maiti et al., 2014).

The seeds of wild carrot (*Daucus carota* L. Family: Apiaceae) have a long history of use relating to fertility, especially as an anti-fertility agent evaluated some physicochemical characteristics (pH, total soluble solids, titratable acidity, color, and firmness) and bioactive compounds (vitamin C, lycopene, carotenoids, and antioxidant activity) during five days. The antioxidant activity remains constant during the time of storage, regardless the temperature. The storage temperature of 22 °C not affected significantly (p<0.05) the color and firmness of tomatoes, at the same temperature, the bioactive compounds (carotenoid, vitamin C, and antioxidant activity)
presented highly correlated with the developments of the red color (Jansen et al., 2014).

Different chemical testing to identified the presence of different groups in methanolic extract of the leaf of Solanum lycopersicum. The negative test result against the Molisch’s reagent proves the absence of gum in the sample. On the other hand, for laboratory determination of alkaloid, it shows negative results against Mayer’s reagent and Wagner’s reagent but it shows positive result against the Dragendorff’s reagent. But most importantly, it shows the positive result with reducing sugars, tannins, flavonoids, steroid and saponins (Rayhanus et al., 2016).

Fruits analyzed have high concentration of lycopene. Lycopene are naturally occurring substances found in many fruits. These researches have proved that carotenoids are beneficial in to diseases, health conditions and anticancer activity. The highest content of lycopene was observed in Citrullus lanatus (watermelon) and followed by Solanum lycopersicum (Tomato). The results of studies can be improved if we use different solvents in extraction process. In this work two methods of extraction were followed via benzene method and method involving use of mixture of hexane, ethanol and acetone. Lycopene is a natural carotenoid found in most of the foods. So, it can be used as potent bio colorant for bio plastics. Use of a natural bio colorant such as lycopene in bio plastics will not have any safety concerns as compared to synthetic colors it may be toxic and difficult to degrade. The point which needs to be careful about lycopene is heat and light sensitivity which can lead to photodecomposition. Utmost care should be taken while handling lycopene, one of the solutions to the problem is to add BHT- acetone. Thus, lycopene is a non-toxic and safe coloring agent. Lycopene provides different benefits and daily uptake is also recommended in present days. So it is completely a natural color can also be known as Lycopene- Bio color (Vrinda Nair et al., 2016).
### 3.2 Proximate analysis

Proximate composition, mineral and vitamin content of 20 edible wild plants used as spices in Cameroon. The plant species were collected from 3 different markets in the West Region of Cameroon and analyzed for their content of crude proteins, and lipid, ash, moisture, available sugars, total phenols, carotenoids, minerals (Ca, Zn, K, Na, Mg, Al, Mn, Cu and Se), and vitamins (A, E and C) as well as for their pH and color. Results revealed that all the plants were low in moisture (7.7 to 10.5 g/100g) but high in ash content (7.7 to 10.5 g/100g). *Hua gabonii* (bark) (1594.5 mg/100g) was a relative source of calcium, *Echinops giganteus* (206.4 mg/100g) exhibited the highest level of iron and *Scorodophleus zenkeri* (310.0 μg/100g) the highest level of selenium. Generally all the plants were found to contain low levels of Zn, Cu and Mg. Wide variations were observed for the proteins and available sugars among the samples. The lipid content of some of the plants were surprisingly relatively high as was the case with *Monodora myristica* (53.4 g/100g), *Xylopia aethiopica* (33.7 g/100g), *Fagara leprieuri* (32.1 g/100g), and *Aframomum daniellii* (23.1 g/100g). All the plants were rich in phenols, carotenoids, vitamin E and C. They are dark in color and in solution they tended to provoke a fair acidification (Armand *et al.*, 2012).

The chemical composition of *Ocimum gratissimum*, *Melanthera scanden* and *Leea guineensis* were investigated. The proximate analysis in % showed that *Melanthera scanden* had the highest amount of ash content of 7.73 and moisture content 6.54 while *Ocimum gratissimum* had the lowest amount of ash content 5.11 and moisture content 5.04. *Ocimum gratissimum* had the highest amount of fat 7.75 and carbohydrate 56.16 while *Melanthera scanden* had the least amount of fat 6.87 and carbohydrate 50.0. *Leea guineensis* had the highest amount of crude protein 19.3 while *Melanthera scanden* had the highest amount of crude fibre 12.66. The mineral analysis in mg/100g indicated that the leaves contained calcium, sodium, potassium,
magnesium, zinc, iron, manganese, and phosphorus. The Phytochemical analysis of the plants showed that the three medicinal plants contained alkaloid, tannins, saponins, steroid, phlobatannin/ terpenoid, flavonoid cardiac glycoside, while phlobatannin was not found in *Melanthera scanden*. The medicinal plants also contained anti nutrient phytin phosphorus, oxalate, phytic acid and polyphenol (Fagbohun *et al.*, 2012).

Proximate analysis, mineral composition and antioxidant potential of approved and four line varieties of *Solanum lycopersicum* for development of food composition data and utilization of them from natural sources. ICP-OES analysis revealed that the contents of Na, K, Ca, Mg, Fe, Cu, Mn and Zn were found to be 17.0 to 20.0, 200.0 to 275.5, 6.4 to 11.3, 7.0 to 8.7, 0.20 to 0.33, 0.03 to 0.05, 0.02 to 0.04 and 0.05 to 0.07 mg/100g, respectively. Antioxidant activity of *S. lycopersicum* fruits was assessed by the measurement of total phenolic contents (TPC), total flavonoid contents (TFC), reducing power and DPPH free radical scavenging assay and percent inhibition of linoleic acid peroxidation system. Yield of extracts of different *S. lycopersicum* varieties were found to be 35.5 to 45.6 g/100g with methanol. The amount of TPC and TFC extracted from different varieties of *S. lycopersicum* were ranged from 6.75 to 9.63 and 0.76 to 2.69 g/100g, respectively. *S. lycopersicum* extracts also exhibited a good antioxidant (53.7-87.2 %) and free radical scavenging potential (IC50 16.7-50.0 μg/mL). The results of the present analytical study revealed that all the newly grown varieties of *S. lycopersicum* exhibited better antioxidant potential than the control variety. Significant variation in the antioxidant activity was observed with respect to approved and line varieties. The results suggest that the *S. lycopersicum* extracts are rich sources of phenolic antioxidant and could be used as natural preservative ingredients in the food industry (Raza Naqvi *et al.*, 2013).
3.3 Anti-microbial activity

To isolate *Endophytic Streptomyces* strains from tomato and examine their antimicrobial activity. *Endophytic Streptomyces* strains were isolated using surface-sterilization methods and identified by morphological characteristics. Antimicrobial activities were measured by the agar plate sensitivity method. Antifungal activity *in vivo* was measured by seedling mortality in infested soils. *Endophytic Streptomyces* showing antifungal activity *in vitro* and *in vivo* may indicate the potential for their use as bio control agents particularly *Rhizoctonia solani* disease of tomato (Cao et al., 2004).

*Lycopersicon esculentum* (Tomato) fruit is a widely antimicrobial potential of ten different tomato seed extracts from “Bull’s heart” and “Cherry” varieties were analyzed against Gram-positive, Gram-negative and fungi. Regarding antibacterial capacity, the different extracts were revealed to be active only against Gram-positive bacteria, and fungi. The chemical composition of the extracts was also pursued, concerning organic acids, phenolic and fatty acids, in order to establish a possible relationship with the observed antimicrobial effect (Marcos Taveira et al., 2010).

The antimicrobial activity of the drug extract was tested against various microorganisms by using disc diffusion method. It revealed that methanol extract of fruits of the drug showed remarkable antimicrobial activity against *Escherichia coli* (Agnihotri et al., 2010).

The comparable quantitative antimicrobial activity of terpenoid was carried out against eleven different bacterial and three fungal strains belonging to species reported to be involved in food poisoning. The terpenoid exhibited considerable good antibacterial capacity against all the organisms tested (Lixandru et al., 2010).
The antimicrobial activity of crude extract was assessed on multi-drug resistant Escherichia coli isolates and it showed anti-bacterial activity against enteric pathogens and could be used for prevention of diarrheal diseases (Rahman et al., 2011).

Mitali Madhusmita Pattnaik et al., (2012) determined the effect of some medicinal plants on growth parameters and diseases, like Alternaria canker, blight, leaf spot, fruit spot, blossom end rot and sunscald of Lycopersicon esculentum. To understand the mechanism, the phytochemical analysis of plants and its effect on bacterial and fungal cultures were investigated.

Extracts executed moderate to good antimicrobial activity against the tested micro-organisms. The extracts was active against tested microorganism for anti-bacterial activity with range of MIC values for Staphylococcus aureus (MIC: 15-39 μg/ml), E. coli (MIC: 16-38 μg /ml), Pseudomonas aeruginosa (MIC: 15-39 μg /ml) and Bacillus subtilis (14-39 μg /ml). The extracts was active against tested microorganism for anti-fungal activity with the range of MIC values for Aspergillus niger (MIC: 17-39 μg/ml), A. flavus (18-37 μg/ml) and Candida albicans (16-35 μg/ml) (Asish Bhaumik et al., 2013).

Fungi isolates were more prevalent than bacteria in the decayed tomato (Solanum lycopersicum L.). Sabo market had most prevalence of both fungi and bacteria isolates, while Igbonna and Oja-Oba markets was followed in that order. Mucor spp. exhibited the highest average fungal value in the Sabo market. Chloramphenicol was the most suitable antibiotic for controlling both microorganisms. Except Bacillus subtilis, varied degree of antibiotic sensitivities and resistances was observed on all the bacteria. Technological improvement of harvesting, packaging, handling, storage and preservation could reduce to tomato fruit losses and invariably enhance shelf life and quality (Bello et al., 2016).
Fruit extracts of Raton and Persimmon presented a vital percentage zone of inhibition against ten pathogenic bacteria. Demonstration of antimicrobial activity against both gram-negative and gram-positive bacteria is an indicated the extracts are a potential source for production of drugs with a broad spectrum activity. Results of this research also support the traditional application of the fruits and suggests. That fruit extracts possess compounds with antibacterial properties it can be used as antibacterial agents in novel drugs for treatment of cancer, artherosclerosis, hypertension, diarrhea, pneumonia, meningitis, wound infections etc. To recapitulate, tomatoes possess pharmacological properties which if properly harness can be used in diseases (Mohammad Firoz Alam et al., 2016).

3.4 Anti-oxidant activity

The nutritional and antioxidant composition of four tomato Portuguese farmer’ varieties widely cultivated in home gardens were determined. The analyzed components included macronutrients, individual profiles of sugars and fatty acids by chromatographic techniques, hydrophilic antioxidants such as vitamin C, phenolics, flavonols, anthocyanin and lipophilic antioxidants such as tocopherols, β-carotene and lycopene. Furthermore, the antioxidant activity was evaluated through DPPH scavenging activity, reducing power, β-carotene bleaching inhibition and TBARS formation inhibition (Jose pinela et al., 1997).

Highly reactive free radicals and oxygen species are present in biological systems from a wide variety of sources. Antioxidant compounds like phenolic acids, polyphenols and flavonoids scavenge free radicals such as peroxide, hydroperoxide or lipid peroxyl and thus inhibit the oxidative mechanisms in nucleic acids, proteins, lipids or DNA and can initiate degenerative disease (Cotelle et al., 2001).
Changes in antioxidant activity during the on-vine ripening of *Lycopersicon esculentum* were studied at four different ripening stages (green, breaker, pink and red ripe). Hydrophilic and lipophilic antioxidant activities (HAA and LAA, respectively) were determined and their relationships to ascorbic acid, total phenols and lycopene and β-carotene contents were analyzed. There was less difference between the measured and calculated LAA as the lycopene level increased, the discrepancy being lowest at the red-ripe stage, indicating the importance of lycopene as a lipophilic antioxidant in tomatoes (Antonio Cano *et al.*, 2003).

The antioxidant activity of the drug extracts was investigated by comparing with the known antioxidant ascorbic acid in in vitro studies. The quantity needed for 50% inhibition of hydroxyl radicals 1250 µg of coriander and 4500 µg of ascorbic acid which showed strong antioxidant activity of the drug (Satyanarayana *et al.*, 2004).

Antioxidant properties of essential oils from coriander were studied by capillary gas liquid chromatography. Antioxidant activity was assessed by oxidation of the aliphatic aldehyde hexanal to the carboxylic acid (Misharina *et al.*, 2008).

The antioxidant activity along with estimation of phenolic and flavonoid a compound of saffron was assessed using different extracts. The saffron showed antioxidant activity by free radical scavenging and ferric reducing power method. The higher activity was found in the methanolic extract of saffron as compared to the corresponding boiling water and ethanolic extracts (Karimi *et al.*, 2010).

Shyamala *et al.*, (2010) reported the chemical composition and antioxidant potential of pulp waste from two vegetables, carrot (*Daucus carota*) and beetroot (*Beta vulgaris*). Different in vitro assays used for determining antioxidant potential of extracts of pulp wastes were: 2, 2-
diphenyl-1-picrylhydrazyl (DPPH) radical scavenging capacity, reducing power and total antioxidant activity by phosphor molybdenum method.

In the past few decades, there has been growing evidence that oxidative stress and specific human diseases can be prevented by including in the diet plant foods that contain large amounts of antioxidants such as vitamins C, E or natural antioxidants such as flavonoids, tannins, coumarins, phenolics and terpenoids (Perumalla et al., 2011).

Despite being an important worldwide vegetable, the genetic structure and domestication of carrot (Daucus carota) is poorly understood. These results provide answers to long-debated questions of carrot evolution and domestication and inform germ plasm curators and breeders on genetic substructure of carrot genetic resources (Massimo Iorizzo et al., 2013).

In an attempt to explain the scientific basis for the medicinal and nutritional benefits of Lycopersicon esculentum (tomato), the phytochemical contents, anti-oxidant and anti-bacterial activity were assessed. The antioxidant properties of L. esculentum extract were evaluated using Lipid peroxidation scavenging activity and Nitric oxide scavenging activity (Omodamiro et al., 2013).

Rammal Marwa et al., (2013) worked the effects of radio frequency on the morphology, chemical composition and the antioxidant power of the plant Lycopersicon esculentum. The DPPH and H₂O₂ tests showed an important decrease in the antioxidant potential after exposure to studied frequency. This decrease was from 42 % to 18 % at the concentration 0.5 mg/ml.

Bachir Bey Mostapha et al., (2014) indicated that the sample tomato present variations in there and antioxidant capacity; this could be attributed to the varietal factor. The hybridization between Joker and Marmande varieties,
which present the highest phenolic and flavonoids amounts, respectively, could give another variety with a high antioxidant activity.

The *Solanum lycopersicum* juice powder possessed good quantities of lycopene and polyphenols, which exhibited antioxidant activity and hence can be utilized in food preparations for enhancing their functional properties. The study also favors for the production of a value added novel spread product from the local *S. lycopersicum* with lower total soluble solids and higher acidity. The spread was also found to be rich in total polyphenols and lycopene content. The product is shelf-stable and was found to be acceptable even after six months of the storage period. Hence, the processing of local *S. lycopersicum* will help to increase the economy of producers which in turn improve the health of consumers (Balaswamy et al., 2015).

The utilization of Tomato pomace (*Solanum lycopersicum* Mill.) for extraction of beneficial antioxidants compounds not only provides health benefits, also adds value to the waste generated by the tomato industries. In our research aqueous extract proved to be effective on the extraction of phenolic, flavonoids and tannins compounds. Therefore, it can be concluded that, the solvent play a key role in the extraction. The efficiency of the active compounds (phenolic, flavonoids and tannins) as anti-viral, antimicrobial and antioxidant agents (Salama et al., 2015).

The forty parameters proved that cultivar highly significantly influenced the physicochemical properties of the tomato seed oil (*Solanum lycopersicum* Mill.) for an edible use. TSO (San Marzano cv) showed the significantly best FA, spectrophotometric characteristics, OSI and cis-oleic acid content. Linoleic and linolenic acid were the lowest in San Marzano, this is positive because they are the most subject to oxidation. On the other hand the linoleicand linolenic fatty acids are recognized to be two EFA, for this reason, TSO can be used dietary supplement in EFA deficient
Antioxidant activity and chelating activity of *Citrus limon* and *Solanum lycopersicum* is found to be significant when compared with standard ascorbic acid and thus concluding that synthetic antioxidants must be replaced by the natural antioxidants which do not have serious side effects but protect from severe diseases which can occur and the effects of the *Citrus limon* and *S. lycopersicum* extract were exerted by scavenging both active oxygen species and electrophiles (Rashmi Dahima et al., 2016).

### 3.5 Anti diabetic activity

Diabetes is one of the stress related disorder. Diabetic subjects were shown to have increased oxidative stress and decreased anti oxidant levels. Antioxidant are claimed to work as anti-stress agent by decrease oxidative stress. Lycopene, a carotinoid is found in tomatoe and tomato product. It is a more powerful anti oxidant with singlet-oxygen quenching capacity. It is hundred times greater than that of β-carotene and vitamin-E respectively (Tripathi et al., 1996).

Saxena et al., (2004) studied the accumulated literature for ten Indian species it have anti diabetic activity, it is medicinally tested some of these herbs such as *Momordica charantia, Pterocarpus marsupium* and *Trigonella foenum* have be documented to be use full for treating type 2 diabetes, mechanism such as stimulating or regenerating effect of beta cells or extra pancreatic effects are proposed for hypoglycemic action of these species.

Rajesh kumar et al., (2005) screened the leaves of *Annona squamosa* for hypoglycemic activity in healthy rats by spreading glucose tolerance test and water extract seems to be use full in controlling blood level in diabetes induced by alloxan streptozotocin.
Exogenous application of chemical elicitors like chitosan and salicylic acid during different stages in fruit development notably increased the level of catalase and peroxidase enzymes activity in fruit tissue. Highest values of activation of the enzymatic activity were obtained when fruits were treated with chitosan at a concentration of 0.1 % (w/v) in the fruit growing stage (Hortensia et al., 2007).

Diabetes-induced hyperlipidemia is attributable to excess mobilization of fat from adipose due to underutilization of glucose. The abnormal high concentration of serum lipids in diabetes is mainly due to the increase the mobilization of free fatty acids from the peripheral depots; since insulin inhibits hormone sensitive lipase. On the other hand, glucagons, catecholamine and other hormones enhance lipolysis. The marked hyperglycemia that characterizes the diabetic state may therefore be regarded as a consequence of the uninhibited actions of lipolysis hormones on the fat depots. The level of serum lipids is usually raised in diabetes and such an elevation represents a risk factor for coronary heart disease. Our results also conformed the previous report that lycopene has a hypochloestrolemic activity (Guang Yang et al., 2008).

Aqueous *Solanum lycopersicum* extract, in a concentration that is found in human diet, has the ability to reduce the radiolabeling on plasma proteins. Probably this occurs due to chemical substances of the *S. lycopersicum* extract could have action on reducing agent used in the labeling process and/or the ability to interact with the plasma proteins, occupying its binding sites. Although these experiments were performed in rats, the results suggest that caution should be taken with interpretation of the data obtained from nuclear medical diagnosis and tests when patients consume *S. lycopersicum* extracts or its derivatives in food (Severo de Paoli et al., 2008).
The hypoglycemic effect of ripe and unripe *Solanum lycopersicum* on streptozotocin-induced diabetes mellitus was examined in this study. The normal control group has normal fasting blood glucose level while the diabetic control group has sustained hyperglycemia throughout the experiment, thus this showed that normal rat chow and citrate buffer have no effects on the fasting blood glucose levels. In other words, it has been revealed in this study that the animals that were confirmed diabetic without dietary intake of either ripe or unripe *S. lycopersicum* has sustained hyperglycemia throughout the experimental duration while on the other hand, diabetic animals with dietary intake of either ripe or unripe *S. lycopersicum* has hypoglycemia at the 3rd and 14th day (the last day of the experimental duration). The ripe *S. lycopersicum* significantly reduced the fasting blood glucose level in diabetic rats at 3rd and 14th days compared to diabetic control group, probably due to their phytochemical constituents, especially carotenoids and chromium which have been reported to have effects on glucose metabolism and possibly (Akinnuga *et al.*, 2010).

Blood was drawn from the retro orbital plexus of the rats under light ether anaesthesia on different occasions it was day 0, day 1, day 3, day 7, day 14 and day 21. Blood samples were allowed to clot in 30 min at room temperature and then they were centrifuged at 5000 rpm per 20 min. The resulting upper serum layer was collected in properly labeled, clean and dry micro-centrifuge tubes. Blood samples was stored at 2-8 ºC and analyzed within one week. This serum specimen was used for the estimation of different biochemical parameters (Hari babu *et al.*, 2013).

The inhibition of key enzymes linked with type 2 diabetes (α-amylase and α-glucosidase) and anti-oxidative properties of the “*Solanum lycopersicum*” used in this study could make them good dietary means for the management and/or prevention of type 2 diabetes. The antioxidant properties of snake *Solanum lycopersicum* which favorably compares with the other *S.*
lycopersicum (except CER), combined with its stronger inhibition of \( \alpha \)-glucosidase activity, but milder inhibition of \( \alpha \)-amylase activities suggests that snake \textit{S. lycopersicum} could be an alternative or complement to the use of \textit{Lycopersicon S. lycopersicum} (Ademosun \textit{et al.}, 2013).

3.6 Seed treatment

Soaking treatment enhanced the germination in all the seed varieties tested. Highest performance in all parameters and for all varieties was recorded from seeds soaked for 24 hours. Seeds soaked for 36 hours gave the second best germination performance in terms of highest percentage and time of emergence except in Xina, where 12 hours treatment had higher percentage of germination. However in terms of the growth parameters 12 Hr. soaking was next to 24 h in all the varieties. In fact, even the control was better than 36 Hr. soaking in plant height and number of leaves in all varieties except in Roma VF and Xina where the number of leaves was the same. Thus suggesting harmful effect of excessive soaking. Seeds were soaked for 36 Hr. were better in dry matter content for Xina but less in UC82B and Roma VF. The high performance in 24 Hr. soaking treatment suggest the seed require an optimal level of moisture rather than fall saturation to activate the embryo to commence the process of cell division, differentiation and multiplication to grow into a seedling. Copeland (1976) observed that most seeds swollen in water and sown in moist environment, germinate faster than untreated seeds. Reported that seeds of \textit{Solanum lycopersicum} require adequate moisture for fast germination (Sabongari \textit{et al.}, 2004).

Blossom drop is the loss of flowers. This is usually preceded by the yellowing of the pedicel. A tomato flower has both male (stamens) and female (pistil) parts within the same flower. The yellow stamens wrap around the greenish pistil in the center of the flower. Under proper conditions, pollen from the stamens transfers to the sticky stigma or tip of the pistil. This
transfer requires a jarring wind or a flick of the finger or insects such as bumble bees and other native bees. Tomato blossoms are self-fertile, and a certain amount of self-pollination of tomato flowers does occur. But pollen does not move well by itself from anther to stigma, as evidenced by the really poor pollination seen in greenhouses when no pollination aid is given. But shaking by wind or mechanical means can cause the release of the pollen, which drops down (the blossoms normally hanging downward) through the stamen tube to the stigma. The primary causes of blossom drop of *Solanum lycopersicum* are environmental such as temperature and relative humidity or lack or excess of fertilizer. Secondary causes can include sufficient amount of water, reduced or extended light exposure, excessive wind, pest damage, foliar disease, excessive pruning, or heavy fruit set (Ozores *et al.*, 2006).

High salt concentration inhibits crop growth and is one of the major problems in agricultural production in arid regions (Malash *et al.*, 2008).

The percentage of germination in case of distilled water treated seeds (control) was 89.5%, *Azadirachta* sp. leaves’ smoke water treated seeds was 72% and *Eucalyptus* sp. leaves’ smoke water treated water was 74%. The percentage of the germination was maximum in case of distilled water treated seeds and least in the case of *Azadirachta* sp. leaves’ smoke water treated seeds have been observed (Rajeswara Reddy *et al.*, 2013).

Trichocompost gave the best performance might be due to the synergistic effect of compost and *Trichoderma* in increasing the root surface area per unit of soil, water use efficiency and photosynthetic activity of seedlings in addition of higher nutrient contents in trichocompost which had been reflected in sample analysis. It also gave the better performance against damping off disease which is in agreement with the findings (Mohammad khurshid alam *et al.*, 2014).
The accelerated aging test was conducted with a saturated salt solution for periods of 48 Hr. or 72 Hr. at 41˚C is an alternative and efficient method to evaluate the physiological quality of *Solanum lycopersicum* seeds. The standard accelerated aging test was the least efficient alternative with the highest moisture content variation (Andreia de Silva *et al.*, 2014).

Seed treatment methods and technologies starts from basic dressing or coating with simplest crude methods and continuous progress in technological advancement are achieved. Moreover, advanced technologies of seed treatment viz. film coating, pelleting etc. came in existence to refine and overcome some limitation or drawback of previous technologies. Seed treatments increase precision and effectiveness of crop protection and product by reducing the applications rate of pesticides applied and hence it is a leading technology in precision agriculture in present days. After knowing about seed treatment we can say that it will become practical, inexpensive and an easy method of micronutrient delivery (Sharma *et al.*, 2015).
Flow Chart- Over View Presentation

Collection of Sample
↓
Preparation of Plant Extract
↓
Preliminary phytochemical analysis of *Daucus carota* L.
↓
Estimate the quantify of bioactive compound
(Spectrophotometer method)
↓
Characterization of isolated bioactive compound
↓
Isolation of bioactive compounds
↓
Purification of bioactive compound
↓
Germination treatment in seeds of *Solanum lycopersicum* L.
(Seeds were soaked with three different types of terpenoid concentration such as 1:1, 1:3 and 1:5)
↓
Growth measurement
↓
Injection of bioactive compound
↓
Extraction of Plant Material
(Cold percolation method)
↓
Preliminary phytochemical analysis of *Solanum lycopersicum* L.
↓
Mineral analysis (Estimation of calcium, magnesium, iron, zinc, phosphate, potassium, sodium and copper)
↓
Pharmacological studies by *In vitro* methods
Anti-Oxidant Activity (*DPPH* radical scavenging, Reducing power scavenging activity)
↓
*In-vitro* anti-diabetic activity (Glucose oxidase activity method and α – Amylase method)
↓
*In-vitro* Antimicrobial Susceptibility Test (Disc diffusion assay)