IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)
e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 5, Issue 4 (Sep. - Oct. 2013), PP 18-21
www.iosrjournals.org

Biochemical Changes in post harvested *Allium cepa* (Onion) and *Capsicum annuum* (Capsicum) under the influence of pathogens

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Abstract: *Vegetables play an important role in human balanced diet and maintaining of good health. These are also called as "Protective supplementary foods" because of its nutritive value.Study were conducted on changes in important biochemical content of the post harvested infected economically important vegetables like onion and capsicum. Result indicateslosses in reducing sugar, non reducing sugar, vitamin c, alpha-amylase, protein, phenol, antioxidant activity and pigments like chlorophyll, xanthophylls, carotene in these vegetables but enhance phenol activityin onion. Thenutrient valueof vegetablesdecreasesor increases due to infection of Botrytisfungus (in onion) and colletotrycumfungus (in capsicum).It can be concluded from the present investigation that fungus infection responsible fordecrease or increase nutrient value of vegetables because they use them for their successful growth and establishment.*

Key Words: *Antioxidant activity, Botrytis, Capsicum,Colletotrycum, Onion, Phenol*

I. Introduction

Vegetables are very important commodities not only in India but all over the world. Vegetables are high yield, comparatively lower cost, palatable and nutritious agriculture product. The nutritive value as these vegetables are having, carbohydrate in abundance, protein of superior quality, minerals and fibers in appreciable amount, vitamin C in good quantity, antioxidant and some other good quality also.Vegetables are most perishable agricultural product which has tremendous post harvested losses. Field observations over the past 40 years have reported that 40 to 50% of horticultural crops produced in developing countries are lost before they can be consumed, mainly because of high rates of bruising,water loss and subsequent decay during postharvest handling. (Kitinoja, 2002; Ray and Ravi, 2005).Losses can also show up as decreased nutritional quality (loss of vitamins, development of health dangers such as myco-toxins) or decreased market value. Producers have to suffer a huge economic loss due to lack of proper understanding about causes and nature of loss, proper preservation methods and their transportation and marketing techniques. A number of post harvested pathogen attacks on these economically important vegetables which resulted diminution in the nutritional values. Fungi and bacteria Infection may take place during the growing season, during harvest time, during handling and storage, during transport and marketing or even after purchase by the consumer (Dennis, 1983). Previous studies of Mba and Akueshi (2001) indicated that pathogenic infections affect the overall level of nutritional component in a plant. The research of Nwaukwu et al., (2012) emphasized the role pathogenic fungi affect the nutritional composition of the edible fruit of *D. guineenses*, a fruit mostly eaten in Africa.The nutrient component generally decreases due to disease pressure, plant responds quickly to disease pressure by showing a decrease in the nutrient composition. The fungi influenced the stored substance or nutrient by absorbing them or by converting some of the substance complex into simple ones (Sawant and Gawai, 2011).

The present investigation was conducted for finding out the biochemical changes altering the nutritional status of the vegetables due to infection by major pathogens.

II. Material and Methods

Fresh and infected samples ofvegetables verity which are extensively cultivated in Rajasthan (India) were collected from farmer's field and vegetable market for the biochemical and pathological analysis. Total 20 samples were collected for study. Spoiled or diseased vegetables were identified by physical examination. Healthy samples were used as control. The organic chemicals vitamin c, reducing sugar, non reducing sugar, protein, phenol, alpha amylase, chlorophyll, xanthophylls, carotene and antioxidant activity were estimated.

2.1 Isolation of fungi:

In pathological study, 10 gm of samples was taken and blended with 100 ml of buffered peptone water.In initial suspension 1 ml was taken aseptically and transferred to the sterile petri dishes. 15 ml of Yeast extract-dextrose chloramphenical-agar medium was poured (previously melted and maintained at 45$\pm$1˚C in water bath from culture bottle) into each petri dish. Inoculums was carefully mixed with medium and allowed to solidify by leaving petri dishes to stand on cool horizontal surface of bio safety cabinet (Indian standard method

for yeast and mould count of food stuff IS 5403:1999). A separate controlled plate was made with 15 ml of medium to check its sterility. Petri dishes were placed inverted in the BOD incubator at 25±1˚C for five days. After 5 days a loop full of fungus was taken from petri dishes on slide. Staining was done by cotton blue stain and morphological characters were observed under microscope.

2.2 Biochemical study:

Estimation of vitamin c or ascorbic acid was done by Aberg methodof Johnson (1948). The changes in non reducing sugar and reducing sugar was estimated by following the phenol sulphuric method Dubois et al., (1956) and Miller method(1972) respectively. Alpha amylase was detected by the method of Bernfield (1955). Total phenols were estimated using standard method of Bray and Thorpe (1954).Protein was separated by the method described by the Lowry et al., (1951).The estimation of total antioxidant activity has done by following the method described byTeowet al., (2007). Chlorophyll was studied by the method of Comar (1942). Xanthophyll was estimated by AOAC (1954). Carotene was detected by the crmatography methodof Interscience publishers (1956).

III. Result and Discussion

Two types of fungi, *botrytis* in onion(Fig.4) and*colletotrycum* in capsicum (Fig.6) were isolated from infected vegetables which caused Neck Rot Disease in Onion and Anthracnose disease in Capsicum (Fig.3 and Fig.5).Biochemical changes in the nutrient value of vegetables were observed due to these infections.ObservationofAmadioha (1998) also indicates that the nutrients were used by fungus for its successful establishment, cellular growth, reproduction and survival within the tissues of the infected fruit or vegetables.The resultsindicate that quantity of vitamin c decreases in bothinfected vegetables as compare to fresh one. The loss of vitamin c (L-ascorbic acid) may be related to its rapid oxidation by the enzyme ascorbic acid oxidase or due to the host – parasite interaction) to the diketone lactone form dehydro L-ascorbic acid (Srivastava and Tondon, 1966).

Carbohydrate (reducing sugar and non reducing sugar) also reduces in fungi Inoculated vegetablesascompared with the uninoculated control. The decrease in the inoculated vegetables could be due to the utilization of storage starch and sugar as a carbon source by the microorganisms during respiration and also a source of energy for microbial growth (Monday, 2005) . Same result was also reported in *DialiumGuineense* (Nigerian fruit)Nwaukwu et al., (2012).

The results showthat phenol level was high in infected onion in comparison to fresh onion. The study of William (1962) indicatedthat high level of total phenol in pathogen inoculated pepper seedlings was found due to in-built resistance against pathogenic infection by the phenoliccompounds and it also confirmed the presence of enemy. According to investigationMahadevan et al., (1965) a post inflectional change in the phenolic compounds of host plant is characteristic ofhost pathogen interaction in diseased plant. The resultsof Majumdar and Pathak (1989) also point out the increase level of phenol in*rhizopus*and *pestalotiopsis infected*guava fruit. According to result,a possible reason might be the breakdown of carbohydrate and intermediates of which was utilized for the formation of phenolic compounds in infected fruit. However, oppositeresult noticed in capsicum, Phenolic compounds decreases in capsicum due to higher activity of phenolic metabolic enzymes or change in auxin metabolismleading to less synthesis and/or more oxidation of phenol. Same results were also observed by Majumdar and Patak (1989) in*colletotrichum*and *botrydiplodia* infected guava fruit.Resultsindicate that protein content in infected capsicum and onion got decreased. Thismay be due to the protein metabolism.Same results were alsoobserved in tomato and brinjal by Ghadsingh and Mandge (2012).

Antioxidant activity also reduces after infection. Same result was given by Dikilitas et al., (2011)in pepper plant by virus. Decrease level of antioxidant in fruit may be due to higher rate of oxidation after infection.

The result indicate that pigments like chlorophyll, xanthophylls and carotene were absent in onion and reduced in capsicum.The fungus produces different types of toxic substances in the cell which might reduces the amount of chloroplast or pigments like chlorophyll, carotene and xanthophylls in infected vegetables. Resultsof Zorn et al., (2003) confirmed that duringmicrobial growth there was an increasein respiration rate which have generated some amount of heat in the micro atmosphere which might have effected on stability of carotenes. The outcomeofMistry et al., 2008 studiesindicated that fruit rot disease of capsicum also reduces fruit dry weight and quantities of capsacin and oleoresin.

As per result, alfa amylase activity is absent or negligible in onion due to lack of sugar amount. Alfa amylase activity also reduces in capsicum after infection this may be due to the presence of alfa amylase inhibitors which reduces production of alfa amylase caused by fungus.Same result were also reportedby M.A. Farukey (2001) in corn plant and(Roy and Gupta, 2000; Heidari et al., 2005; Muralikrishna and Nirmala, 2005)incereals andGiri and Kachole(1998)in legumes.

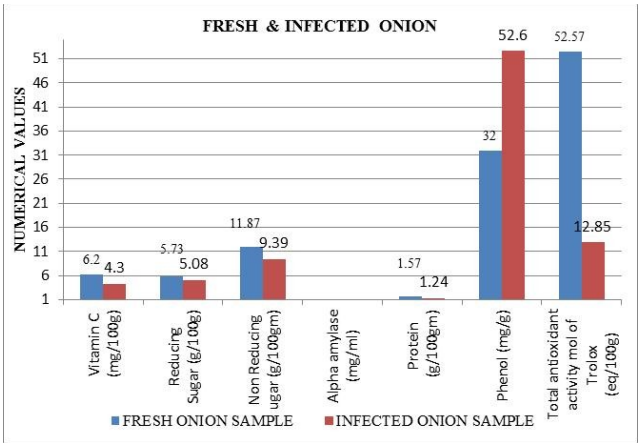

Figure-1 Biochemical content in fresh and infected Onium(*Allium cepa*)

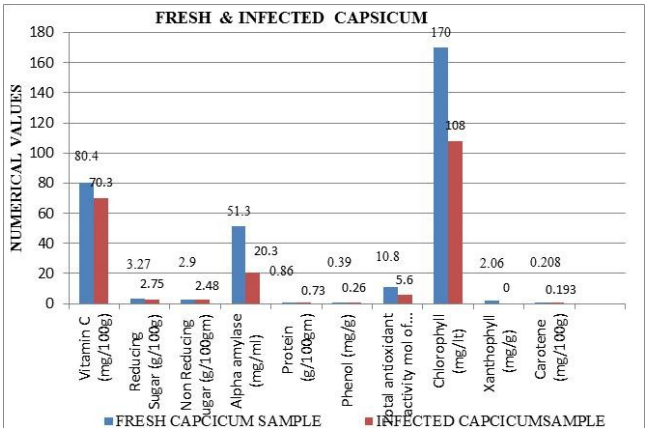

Figure-2 Biochemical content in fresh and infected Capsicum (*Capsicum annuum*)

Figure-3 Neck Rot Disease in Onion**Figure-4***Botrytis* fungus in Onion

Figure-5 Anthracnose disease in Capsicum **Figure-6***colletotrycum* fungus in Capsicum

IV. Conclusion

The present findings suggest that the onion and capsicum are economic important vegetables and are rich ofvitamin c, phenol, sugar, total antioxidant activity etc. The post harvested infection reduces the useful content of the vegetables due to significant biochemical changes and ultimately render them unfit for human consumption and reduces their market value therefore vegetables should be free from post harvested infection and should be free from microbes.

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