

FUNGAL DECAY OF COMMERCIAL RED PEPPER (Capsicum annum Var. annum L.) AND PROXIMATE ANALYSES OF INFECTED FRUITS IN KEFFI, NASARAWA STATE, NIGERIA



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Abstract

Fungal decay of red pepper fruits (Capsicum annum var. annum) and proximate analyses of infected fruits wen studied. The disease survey covered four locations in Keffi. The locations include; Keffi market, Angwan Lamini, Angwan Kaje and Angwan Fulani. Out of the 120 fruits surveyed, 80 (66.7%) had isolates. The fungal isolates wen Rhizopus stolonifer (37.5%), Aspergillus niger (23.3%), Aspergillusflavus (4.2%) and Rhizopus nigrican (1.7%), The incidence of fungi species in different locations Keffi were: Keffi market (20.8%), Angwan Lambu (15.0%), Angwan Kaje (18.3%) and Angwan Fulani (12.5%) There was no significant difference (P<0.05%) in the incident of the different isolates in relation to location. Proximate analysis of the decayed and undecayed red pepper shoioti, that undecayed red pepper fruits have higher values of nutritional content. The relative humidity around Kejfi market was the highests; 57 while Angwan Fulani had the least 54. Factors which enhance the spread of these fungi should be cant rolled.

Keywords: Fungal, Decay, Redpepperfruits, Proximate analysis, Keffi INTRODUCTION As impo

Red pepper is the red pod like fruit of *Capsicum annum* and belongs to the family Solanaceae (Dutta, 2008). Nutritionally, red pepper is an excellent source of B Vitamins and is superior to *Citrus* as a source of vitamin C when eaten raw. It contains more vitamin A than any other food plant by weight. *Capsicum* also contains significant amounts of magnesium, iron, thiamine, riboflavin and niacin (Govindarajan, 1985).

It contains an alkaloid known as capsaicin that acts directly on the pain receptors of the mouth and throat to produce the burning sensation associated with peppers (Govindarajan, 1985). Ingesting capsaicin by eating red pepper not only increases the flow of saliva and gastric secretions but also stimulates appetite (Solanke, 1973). These functions work together to aid the digestion of food. The increased saliva helps ease the passage of food through the mouth to the stomach where it is mixed with the activated gastric juice. These functions play an important role in the lives of people whose daily diet is principally starch based (Solanke, 1973). Red pepper is used as spices and vegetables in our daily meals (Perry, 2007). Throughout the world, Capsicums are also used as a source of colour pigment for commercial products such as cheese sausage, salad dressings and meat products (Govindarajan, 1985). Capsicum is a safe and effective analgesic agent in the management of arthritis pain, herpes foster related pain, diabetic neuropathy, post mastectomy pain and headaches (Perry, 2007).

As important as this red peppers are, they an susceptible to a wide range of field and storage diseases especially fungi (Andrew, 1993). The research is aimed at isolating fungi associated wifli decay of red pepper fruits, carrying out proximate analyses of infected fruits and determining facton which enhance the spread of the disease in Keffi area.

MATERIALS AND METHODS Collection of the samples

The laboratory experiments were carried out in the Plant Science and Biotechnology Unit Laboratory, Department of Biological Sciences, Nasarawa State University, Keffi while the survey work was among selected locations in Keffi Local Government Area, Nasarawa State. These locations include, Angwan Lambu, Angwan Kaje, Angwan Fulani and Keffi market. Regular red pepper sellers were visi¹ twice (2) monthly for the collection of decayed pepper fruits. The areas were visited six times ill three months for the collection of decayed red pepper fruits. During the first visit which was in June, 2010, five (5) red'pepper fruits were collected from each of the four (4) locations, making a total of twenty (20) red pepper fruits. For the second visitin the same month another twenty (20) red pepper fruits were collected, making a total of (40) nd pepper fruits for that month. In three (3) months June-August, 2010, one hundred and twenty (120 decayed red pepper fruits were obtained.

thrirtion and Identification of Fungal Isolates bibon of fungal species was done using direct

I seriate agar plating method of Udo *et al.* (2001). Small portions of red pepper fruits containing advancing margin of rot and adjoining healthy tissue (Onyuike and Maduewesi, 1985), were pinched with sterile wire loop which was passed over the flame for red host sterilization. The portion was transferred into potato dextrose agar, where the rot fungi were isolated and later identified. Fungal identification was carried out according to the methods of Domsch *et al.* (1980) and Samson *et al.* (1984). The data obtained from the survey were > subjected to chi-square statistical analysis. I Photomicrography of the isolates were compared I with fungi species published by Domsch *et al.* \(1980) and Samson *etal.* (1984).

Proximate Analyses

The proximate analyses for the red pepper fruits sample for moisture, ash, crude fibre, crude fat were carried out in triplicates using methods described by Association of Official Analytical Chemists (AOAC, 1980). The nitrogen was determined by the micro Kjeldhal methods described by Ekundayo and Idzi (1990), and the ^nitrogen content was converted to protein by multiplying by factor of 6.25. The carbohydrate [£] content was determined by difference. All proximate values were reported in percentage.

Determination of the Relative Humidity (RH) of the various locations in Keffi

The relative humidity of the surveyed locations in Keffi was examined monthly using a hygrometer as described by Binbol (2007) method.

RESULTS AND DISCUSSION

i Species of fungi isolated and identified from decayed red pepper fruits were; *Khizopus stolonifer* (37.5), *Aspergillus niger* (23.3%), *Aspergillus flavus* (4,2%) and *Khizopus nigrican* (1.7%) (Table 1). The

incidence of fungi species in four different locations in Keffi Local Government Area is presented in

E Table 2. Keffi market had the highest incidence of fungi species (20.8%), while Angwan Fulani had the lowest (12.5%). Out of a total of 120 red pepper fruits examined, 80 (66.7%) had fungal isolates while 40 had none (Table 2). There was no significant difference (P<0.05%) in the incidence of the different isolates in relation to location (Table 3). Proximate analyses of decayed and undecayed red pepper fruits showed a reduction in the nutritional content of decayed red pepper fruits (Table 4). Result from the relative humidity showed that Keffi market had the highest amount of water vapour in the air 58% while Angwan Kaje had 53% (Table 5).

The study has shown some species of fungi responsible for red pepper fruits post harvest decay in Keffi. These fungi include; Rhizopus stolonifer, Aspergillus niger, Aspergillus flavus and Khizopus nigrican. These fungal species were also isolated and identified earlier by Govindarajah (1985). Reports showed that fruits and vegetables are rotted by organisms that either infect the produce while still immature and attached to the plant or during harvesting, subsequent handling and marketing (Morris, 1977). Decay of the red pepper fruits may have been aided by mechanical injuries on the surfaces of the produce such as finger nail scratches, abrasions and insect punches. Rhizopus stolonifer was the most frequent of all the fungal isolates. This could be due to the production of enzymes such as cellulase, pectinase, lipase, lignase, sucrase more than the rest fungi (Kushman, 1975). With these enzymes Rhizopus stolonifer could easily infect its host and cause damage as observed in this study. The presences of these fungal isolates have some health implications for pepper consumer. Some of these fungal pathogens produce mycotoxins in their infected products. Mycotoxins are hazardous to human and animal health (WHO, 1979). Aspergillus spp produce aflaxtoxins (Bl, B2, Gl, G2) of which aflatoxins Bl is highly carcinogenic causing hepatoma (WHO, 1983).

Keffi market had more fungal attack than other locations while Angwan Fulani had the least fungal decay. The high incidence of these diseases in Keffi market could be attributed to high incidence of economic activities in this area compared with other locations where handling and marketing of the red pepper fruits were less. The high relative humidity in Keffi market area may have played a prominent role in the high incidence of the disease in the area. This is because the genetic composition of the red pepper may have been altered by high relative humidity which predisposed (Onyeke *et al.*, 2003), the red pepper fruits to the attack of the fungal species isolated in this work.

There is no significant difference on the percentage incidence of the disease condition in all the locations. All location adjoins each other as such, have barely little variation in weather and climatic conditions, though with little variation in the soil type. Fungi growing on plant parts and produce use them as food. They produce enzymes which hydrolyze the food substances into forms absorbed in the body (Ogundana *et al*, 1970). This absorptidh may have resulted in the reduction in the nutritive qualities of the produce as recordec1. in the proximate analyses conducted.

| Fungal Isolate | No attacked of 120 | Attach rate (%) | |
|--------------------------|--------------------|-----------------|--|
| Rhizopus stolonifer | 45 | 37.5 | |
| Aspergillus niger | 28 | 23.3 | |
| Aspegillus flavus | 5 | 4.2 | |
| Rhizopus nigrican | 2 | 1.7 | |
| | 80 | 66.7 | |

Table 1: Frequency of occurrence of fungi isolates from 120 red pepper fruits

Table 2: Incidence of fungi species in different locations in Keffi Local Government Area

| Location | No of red pepper | No (%) infected with |
|---------------|------------------|----------------------|
| , | fruits examined | fungi species |
| Keffi Market | 30 | 25(20.8)* |
| Angwan Lambu | 30 | 18(15.0)* |
| Angwan Kaje | 30 | 22(18.3)* |
| Angwan Fulani | 30 | 15(12.5)* |
| | 120 | 80(66.6) |

Table 3: Chi – square on the relationship between fungi isolates and different locations in Keffi Local Government Area

| Location | No of red pepper | No with | No without |
|---------------|------------------|---------------|---------------|
| а та В | fruits examined | fungi species | fungi species |
| Keffi Market | 30 | 25(20)* | 5(10)* |
| Angwan Lambu | 30 | 18(20)* | 12(10)* |
| Angwan Kaje | 30 | 22(20)* | 8 (10)* |
| Angwan Fulani | 30 | 15(20)* | 15(10)* |
| | 120 | 80 | 40 |

*Numbers in parenthesis are expected frequencies

H₀: There was significant difference ($P \le 0.05\%$) in the incidence of different isolates in relation to location.

Ftab 7.82 < Fcal 18.7, therefore we reject the hypothesis

Table 4: Percentage proximate composition (Dry Weight) of red pepper

fruits

| Nutrient values | | | | | | |
|-----------------|---------|------|-------|-------------|----------|--------------|
| State of fruit | Protein | Fat | Ash | Crude fibre | Moisture | Carbohvdrate |
| State of ITult | | | | 0.000 | | |
| | | | | | | |
| Decayed | 12.09 | 4.51 | 12.38 | 28.89 21.64 | 10.69 | 25.67 32.5 |
| Undecayed | 17.86 | 5.28 | 12.45 | | 10.27 | |

Table 5: Relative humidity of the locations surveyed in Keffi local Government Area

| Location | | Relative Humidity (RH) % | | | |
|---|----------|---|--|--|--|
| Kef fi Market | 58 | | | | |
| Angwan Lambu AngwanKaje Angwan Fulani | 56 54 53 | | | | |
| CONCLUSION | | Dutta A C (2008) Botany for Degree Students | | | |

CONCLUSION

The survey shows that fungal pathogens are prevalent in Keffi. The economic implication of their attack on red pepper fruits are enormous. Modern methods in crop improvement should be employed to find a complete solution to this menace.

REFERENCES

- Andrew, 3. (1993). Diffusion of MesoamericanFood Complex to South-eastern Europe. Geographical Review, 83(2): 194-204.
- Association of Official Analytical Chemists, (AOAC) (1980). Methods of Analysis. 11* Edition, Washington DC, USA.
- Binbol, N. L. (2007). Climate .in Geographical Perspective on Nasarawa State. Akwa V. L, Binbol, N. L., Samaila, K. L. and Marcus N. D. A. (Eds).. Publ. Department of Geography, Nasarawa State University, Keffi, Nasarawa State, Nigeria, pp. 35 - 37.
- Domsch, R. H. Can, W. & Anderson, I. (1980). Compendium of soil Fungi. London Academic Press Land, II: 1 - 895.

- tta, A. C. (2008). Botany for Degree Students. Department of Botany and Biology, Cotton College, Gauhati, Oxford University Press, p. 445.
- Ekundayo, C. H. & Idzi, E. (1990). Mycoflora and Nutritional value of shelled melon seeds (*Citrillus vulgaris* Schirad) in Nigeria. Plant Food Nutrition, 42:215 - 222.
- Govindarajan, V. S. (1985). *Capsicum:* Production, Technology, Chemistry and Quality. Botany cultivation and primary processing. Critical Review in Food Sciences and Nutrition, 22(2): 108-175.
- Kushman, L. J. (1975). Effect of injury and relative humidity on weight and volume loss of sweet potatotes during curing and storage. Hortscience No. 275 - 277.
- Morris, S. C. (1977). Plant Harvest Handling Disease of Rbckmelon. Commercial Horticulture GosfordN.S.N. !
- Ogundana, S. K., Havia, S. H. '& Ekuftdiayb, JiA. (1970). Fungi Associated with Soft Kfrtvof Yams (*Dioscorea spp*) m storage, Nigeria stored product research institute Technical Report, 10:14-45. ;

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- Onyeke, C C, Maduewesi, J. N. C. & Ugwuoke, K. I. (2003). Incidence of post harvest fungal disease of banana. Nigeria Journal of Botany, 16:7-15.
- Onyuike, R. C. I. & Maduewesi, J. N. (1.985). Variability and Pathogenicity of isolates and sensitivity of benlate, Dithane, M 45 and PCNB on cocoyam Rot fungi. Nigeria Journal of plant, protection, 9:74 - 78).
- Perry, L. (2007). Start Fossils and the domestication and dispersal of Chilli peppers (*Capsicum spp*) in the Americans Science, 315:986-988.
- Samson, R. A., Hoskstra, E. S. & Van Orschot, A. N. (1984). Introduction to food Borne fungi. Netherlands Academy of Arts and Sciences, pp. 11-125.

Solanke, T. F. (1973). The effects of red pepper *(Capsicum frutescens)* on gastric acid Secretion. Journal of surgical Research,15: 3809.

- Udo, S. E., Madungu, B. E. & Isemin, C. D. (2001). Inhibition of growth and sporulation of fungal Pathogens on sweet potato and yams by garlic extract. Nigeria Journal of Botany, 14:35-39.
- WHO (1979). Mycotoxin, Environmental Health Criteria No. 11, Geneva World Health Organisation.
- WHO (1983). Prevention of Liver Cancer, Technical Report No. 691, Geneva, World Health Organization.