ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 7, Issue, 03, pp.13690-13693, March, 2015

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

MYCOFLORA OF QUAIL FARMS IN JOS, NIGERIA

Nwadiaro, P. O., *Ogbonna, A. I., Itelima, J. U., Sila, M. D. and Buoro, E. O.

Department of Plant Science and Technology, University of Jos, P.M.B. 2084 Jos, Nigeria

ARTICLE INFO

Article History:
Received 10th December, 2014
Received in revised form
27th January, 2015
Accepted 23rd February, 2015
Published online 31st March, 2015

Key words:
Quail farms,
Fungi,
Poultry droppings,
Air spora,
Mycotoxins.

ABSTRACT

The fungal flora of selected quail farms in Jos, Plateau State Nigeria was investigated. Three prominent farms were sampled in Utan, Angwa Rukuba and Kufang areas of the metropolis. The quail droppings and air spora of the farms were sampled using Sabouraud Dextrose Agar medium. 8 genera of fungi including 2 yeasts, *Candida* species and *Saccharomyces cerevisiae* were isolated from the poultry droppings. There was no significant difference (P>0.05) in the frequency of occurrence of the fungal isolates. The C. sp was the dominant species (28.7%) in the three farms under investigation. This was followed by *S. cerevisiae* (26.0%) and the least by *Alternaria alternata* (0.4%). In the poultry droppings investigations, the Angwan Rukuba farm had the highest number of isolates 178(38%). Utan farm had 168(36.3%) while Kufang farm had the least number 119 (25.7%). The air spora of the 3 farms harboured 13 species of fungi with *Aspergillus* species the most dominant. *A. niger* had the highest frequency of occurrence of 22.7 % from the farms while *Mucor racemosus* had the least occurrence of 1.5%. Some of the fungal isolates are known to be opportunistic pathogens and mycotoxins producers. The health implications of the isolated fungal species have been discussed.

INTRODUCTION

Quail is a small plump-bodied bird, about 18cm (7 inches) in length and spends most of its time on the ground (Musa *et al*., 2008). The Japanese quail is the smallest avian species farmed for meat and egg production (Panda and Singh 1990) and has however assured worldwide importance. Distinct characteristics of the quail bird include rapid growth (enabling the bird to be marketed at about 5-6 weeks of age), early sexual maturity resulting in high rate of lay, much lower feed intake, less space requirement than other domestic fowls and less susceptibility to common poultry diseases (Edache *et al.*, 2005). By 1910 Japanese quail was widely farmed for their eggs, meat and treatment of certain ailments in that country (Musa *et al*., 2008). Due to its multipurpose utility, Japanese quail gained importance and expanded since 1960 in the United States of America, Italy, France and Hong Kong. Quail farming started in Nigeria since 1992 as reported by Haruna *et al*. (1997). There has been an increase in quail farming in the country and quail has being a cheap source of cholesterol free meat and contains low fat. In Plateau State Nigeria, the Japanese quail (*Coturnix coturnix* Japonica) was introduced at National Veterinary Research Institute Vom in 1992 and subsequently distributed to farmers with vigorous encouragement and support of the National Agricultural Research Project. Presently quails have acclimatized and adapted in many parts of Nigeria including Kano, Yobe, Lagos, Niger and Kwara States. The importance of animal protein to provide much of the protein intake is evident in developing countries and has led people into quail farming. Quail meats are renowned for their high protein and low caloric value thus making it a choice for hypertension prone individuals. Quail meat and eggs are claimed to be useful in increasing of libido, though not yet proven scientifically. The feathers of quail are used in making mattresses, pillows and ornaments while the droppings very rich in Nitrogen and Phosphorus are valuable manure. Like other poultry birds quails are infected by many micro-organisms including fungi. Sadiq *et al*. (2006) noted that fungal diseases seem to be one of the great obstacles to poultry farmers causing high morbidity, mortality and production losses. The fungi that have been implicated include *Aspergillus fumigatus*, Sadiq *et al.* (2006), Fusarium sp. (Ogido *et al.*, 2004), *Mucorsp* and *Torulopsis* sp in India (Chate and Bhi-vgade, 2010) among others. The warm environment of poultry houses in Nigeria is attributed for easy colonization and spread of fungi (Clara *et al.,* 2013).

Corresponding author: Ogbonna, A. I.
Department of Plant Science and Technology, University of Jos, P.M.B. 2084 Jos, Nigeria

MATERIALS AND METHODS

Collection of samples

Fresh samples of poultry droppings were collected from 100 quails from each of the three farms under study and were introduced into separate well labeled plastic containers and were transported to the laboratory for processing. The

sampling of the poultry farm air mycoflora was done in five different locations of each of the poultry farms.

Fungal isolation from the air spora and quails droppings from the farms

The methods of sampling employed for the isolation of fungi were soil plate method of Warcup (1950) for the poultry droppings and the exposed plate method of Upsher and Griffiths (1973) for the air spora. The exposure time for the sedimentation of the air spora was 15minutes. The Petri-dishes were incubated at 25±2^{o}Cfor 15 days. The fungal colonies that developed were sub-cultured severally for the development of pure cultures.

Identification of fungal isolates

Fungal cultures were identified using cultural and morphological features. The type, size, shape of the conidia and the morphology of the conidiophore were examined using Nikkon light microscope. Lacto phenol was employed as the mounting fluid and cellotape method was found very useful in the mounting of the fungal isolates. Reference was made to Barnett *et al*. (1983), Guinea *et al*. (2006), Domsch and Anderson (1980). The relative percentage frequency (%) of the fungal isolates was calculated using the formula described by Ghiasian *et al*. (2004).

Data sets were examined by one-way analysis of variance (ANOVA) using Statistical Package for Social Sciences (SPSS) to compare the means of the different variables. A P-value of less than 0.05 was considered significant.

RESULTS AND DISCUSSION

The present mycological investigation of quail droppings from different quail farms in Jos metropolis revealed the occurrence of nine species of fungi belonging to eight genera including two yeasts (Table 1). The genera included *Alternaria* (0.4%), *Aspergillus* (7.6%), *Candida* (28.7%), *Chaetomium* (5.2%), *Mucor* (22.3%), *Penicillium* (8%), *Saccharomyces* (26%) and *Trichoderma* (1.9%). The two yeast species, *Candida* sp and *Saccharomyces cerevisiae* were the most dominant species as they were frequently isolated from the three farms Angwan Rukuba (29.6%), Utan (26.8%) and Kufang (30.3%) respectively for *C*. sp.

The other yeast, *S. cerevisiae* had 25.6% from Angwan Rukuba, 29.4% from Kufang and 23.8% from Utan. Angwan Rukuba farm had the highest number of isolates (38%), followed by Utan (56.3%) and kufang the least (25.7%).

$$\text{Relative percentage frequency (\%)} = \frac{\text{number of a particular fungal species isolated}}{\text{Total number of fungi isolated}} \times \frac{100}{1}$$

Table 1. Frequency of isolations from quail droppings in 3 poultry farms in Jos Nigeria

Fungal isolates	Farms			
	Utan	AngwanRukuba	Kufang	Total
Alternaria tenuissima (kunze ex pers.) Wilt	02 (1.2)	00 (0.0)	00 (0.0)	02 (0.4)
Aspergillus niger van Tieghem	12 (7.14)	14 (8.0)	09 (7.6)	35 (7.6)
Chaetomium bostrychoides Zopf	12 (7.14)	08 (4.6)	04 (3.4)	24 (5.2)
Penicillium nigricans Bain. Ex Thom	10 (6.0)	12 (6.8)	06 (5.0)	28 (6.1)
Penicillium oxalicum Currie & Thom	05 (3.0)	04 (2.3)	00 (0.0)	09 (1.9)
Trichoderma harzianum Rifai	06 (3.6)	00 (0.0)	03 (2.5)	09 (1.9)
Candida sp	45 (26.8)	52 (29.6)	36 (30.3)	133 (28.7)
Saccharomyces cerevisiae Meyen (Hansen)	40 (23.8)	45 (25.6)	35 (29.4)	120 (26.0)
Total	168 (36.3)	176 (38.0)	119 (25.7)	463 (100)

***Figures in parenthesis are the relative percentage frequency of occurrence**

Table 2. Frequency of fungal isolations of airspora of 3 poultry farms in Jos Nigeria

Fungal isolates	Farm			
	Utan	AngwanRukuba	Kufang	Total
Aspergillus flavus Link	9 (12.9)*	8 (11.6)	8 (12.5)	25 (12.3)
A. fumigates var *unilateralis*	6 (8.6)	6 (8.7)	7 (10.9)	19 (9.4)
A. niger van Tieghem	15 (21.4)	18 (26.1)	13 (20.3)	46 (22.7)
A. parasiticus Speare	3 (4.3)	0 (0.0)	5 (7.8)	08 (3.9)
A. sydowii (Bainer) Thom and Church	2 (2.9)	2 (2.9)	0 (0.0)	4 (2.0)
A. tamarii Kita	6 (8.6)	5 (7.3)	2 (3.1)	13 (6.4)
Cladosporium sp	5 (7.1)	0 (0.0)	7 (10.9)	12 (5.9)
Fusarium sporotrichoides (Peck) Wollenw	9 (12.9)	10 (14.5)	8 (12.5)	27 (13.3)
F. sp (Mart) Sacc.	8 (11.4)	8 (11.6)	6 (9.4)	22 (10.8)
Mucor racemosus Fresen.	2 (2.9)	1 (1.5)	0 (0.0)	03 (1.3)
Paecilomyces variotii Bainer	3 (4.3)	5 (7.3)	2 (3.1)	10 (4.9)
Penicillium expansum Thom	0 (0.0)	4 (5.8)	2 (3.1)	06 (3.0)
Scopulariopsis brevicaulis (Sacc) Bainer	2 (2.9)	2 (2.9)	4 (6.3)	08 (3.9)
Total	70 (34.5)	69 (34)	64 (31.5)	203 (100)

*Figures in parenthesis are the relative percentage frequency of occurrence

6 species of *Aspergillus* (23.1%), 2 species of *Fusarium* (15.4%) and I species of *Cladosporium, Mucor, Penicillium, Paecilomyces* and *Scopulariopsis*, indicating 7.7% each. Poultry farm in Utan had the highest number of fungal isolates 70(34.5%), followed by that of Angwan Rukuba 69(34%). The least number was recorded for Kufang farm 64(31.5%). There was no significant difference (P>0.05) in the number of isolates from Utan (35.5%), Angwan Rukuba (34%) and Kufang (31.5%) farms (Table 2). The finding of this research work is in conformity tothose of Akpomie *et al*. (1999). The authors isolated *Aspergillus* and *Mucor* species from chicken droppings. Other researchers had similar results (Akpomie *et al*., 1999; Maciorowski *et al*., 2007; and Saleh *et al*., 2007). Among the *Aspergillus* species isolated, *A. niger* occurred most frequently (22.7%), *A flavus* followed (12.3%) and *A. fumigatus* (9.4%). This result conforms to that of Mehdi *et al*. (2014) who also isolated *Aspergillus, Mucor, Penicillium, Alternaria* and other fungi from the combs and wattles of Iranian chickens. Miljkovic *et al*. (2011) also had similar findings in their work on Fungi on feathers of common clinically healthy birds in Belgrade. Most of the fungal isolates from this study are known soil fungi and are opportunistic. The fungi spores must have attached themselves to the droppings which were in direct contact with soils. There was no any sign of infection or disease condition on the quails but since the isolates are opportunistic fungi, they can induce disease condition to the quails when the body immune system is compromised. *Mucor* species which is one of the isolates have been implicated in invasion of tissues of immuno-compromised individuals, including patients with severe burns, leukaemia, diabetes mellitus.

Another important disease associated with the exposure to the spores of these fungi is aspergillosis among which is broncho-pulmonary aspergillosis (BPA) which has been diagnosed in patients whose respiratory tracts are heavily colonized with *Aspergillus* species. *A. niger* has been implicated in patients with atopic asthma (Brook *et al*., 2007). Aspergillosis is an economically important disease in poultry industry that affects the respiratory system and can emerge as an outbreak (Maciorowski *et al*., 2007). Donham (1991) reported inhalation of a large amount of the *Aspergillus candidus* spores which caused Organic Dust Toxic Syndrome in a group of polish student after grain shoveling. Others reports included that of Lacey and Dutkiewicz (1994) who reported that *A. versicolor* was identified as a cause of allergic alveolitis. *Penicillium* species have been recognized as causative agents of fungal allergy (Burge, 1989). The isolation of the airspora in the poultry farms revealed six species of *Aspergillus* which signals a serious danger of occupational exposure of developments of mytotoxicosis / mycosis in the birds and the poultry workers.

Mycotoxicosis is yet another important disease associated with exposure of the birds and or the poultry attendants to the spores of these fungi such as the *Aspergillus flavus*, *A. fumigatus* and *A. niger* which were equally isolated from the airspora of the poultry farms in this study. Inhation of the air or dust around the poultry can trigger various deleterious mycotoxicoses in the birds and also the poultry attendants. Jacobsen *et al*. (1993) reported that aflatoxins are mainly produced by various *Aspergillus* species, *A. ochraceus* produces ochratoxin and some species of *Fusarium* produce fumonisins which produce a variety of mycotoxicoses in humans exposed to poultry dust. It is pertinent to note the Public health importance of these fungal isolates. The farm workers are exposed to the ranges of mycosis/mycotoxicoses caused by spores of these fungi. In this study, the two yeast species isolated has the highest frequency of occurrence in three poultry farms. *Candida* species especially *C. albicans* is an important zoonotic fungus and has been implicated in systemic candidiasis in poultry and other animals (Warnock, 2006). Kloeckera and Malassezia and Trichosporon were isolated in Germany by Grunder *et al*. (2005).

Conclusion

Quail poultry farms in Jos have been found to harbour variety of fungi which are both saprophytic to pathogenic in their air spora and the droppings. Human beings in contact with poultry, both at pets, household and commercial levels have the risk factor for exposure to different pathogens associated with birds. There is need therefore for awareness in educating members of public on the importance of improved public health care in order to monitor effectively zoonotic diseases associated with avians and the way to control them.

Acknowledgements

The authors would like to express their gratitude to the members of staff of Applied microbiology unit of Plant Science and Technology Department of University of Jos for their kind cooperation during the culturing of the samples. We specially thank the laboratory technologists of the department for their technical advice.

REFERENCES

Akpomie, O. O, Ameh, J. B., Kambai, J. and Adewale, A. 1999. The microbiological potential of chicken droppings in leather manufacture. *W. Afr. J. Biol. Sci*., 10: 51-58.

Barnett, J. A., Payne, R. W. and Yarrow, D. 1983. Yeast Characteristics and Identification Cambridge Uni. Press P. 811.

Brooks, G. F., Carrol, K. C., Butel, J. S and Morse, S. A. 2007. *Jawetz, MelnickandAdelberg's Medical Micro-biology.* New York: McGraw-Hill.

Burge, H. A., 1989. Airborne allergenic fungi. *Immunol. Allergy Clin N Amer*., 9: 307-319.

Chate, D. B. and Bhivgade, S. W. 2010. Fungal Disease Incidence inside Poultry farm at AUSA. *International Referred Research Journal* ISSN-0974-2832.2 (15).

Clara, N. K., Haruna, M. K., Paul, A. A. and Jarlath, U. U. 2013. Fungal Contamination of some Poultry Houses in Kaduna State, Nigeria. *Journal of Advanced Veterinary Research,* 3: 98-101.

Domsch, K. H., Gams, W. and Anderson, T. H. 1980. *Compendium of soil fungi*. Vol. 1. Academic Press, London.

Dutkiewicz, J. 1997. Bacteria and fungi in organic dust as potential health hazard. *Ann Agric Environ Med*., 4: 11-16.

Edache, J. A., Musa, U., Haruna, E. S., Karsin, P. D., Esilonu, J. O. and Jibrin, I. I. 2005. Calcium requirement of

Japanese quail (*Coturnix cortunix* Japonica) chicks in Plateau State, Nigeria.*Nigerian Journal of Animal Production*, 32 (2): 246-252.

Ghiasian, S. A., Kord-Bacheh, P., Rezayat, S. M., Maghsood, A. H. and Taherkhani H. 2004. Mycoflora of Iranian maize harvested in the main production areas in 2000. *Mycopathology,* 158 (1): 113–121.

Grunder, S., Mayser, P., Redmann, T. and Kaleta, E. 2005. Mycological examinations on the fungal flora of the chicken comb *Mycoses,* 48: 114-119.

Guinea, J., Pelazz, T., Akala, L. and Bouza, E. 2006. Outdoor environmental levels of *Aspergillus sp*. Conidia over a wide geographical area. *Medical Mycology,* 44, 349-356.

Haruna, E. S., Musa, U., Lombin, L. H., Tat, P. B., Shamaki, P. D., Okewole, P. A. and Molokwu, J. U. 1997. Introduction of quail production in Nigeria. *Nig. Vet. J*. 18: 104-107.

Jacobsen, B. J, Bowen, K. L, Shelby, R. A. and Diener, U. L. Mycotoxins and mycotoxicoses. Alabama cooperative Extension system Circular ANR-767 AlabamAand M and Aburu Universities; 1993. [accesem Jan. 10 2010]. Available at: http://www. access. edu/department/ grain/images/anr 76702.gis.

Lacey, J., and Dutkiewicz J. 1994. Bioaerosols and occupational lung disease. *J. Aerosol. Sci*., 25: 1371-1404.

Maciorowski, K., Herrera, P., Jones, F., Pillai, S. and Ricke S. 2007. Effects on poultry and livestock of feed contamination with bacteria and fungi. *Anim. Feed Sci. Technol*., 133: 109-136.

Mehdi, T., Hassan, G. C., Ali, R. K., Ahmed, E. and Asad, B. 2014. Fungal flora of the combs and wattles of Iranian native chickens. *Iranian Journal of Microbiology,* 6 (1): 46-50.

Miljkovic, B., Pavlovski, Z., Jovicic, D., Radanovic, O. and Kureljusic, B. 2011. Fungi on feathers of common clinically healthy birds in Belgrade. *Biotechnol Anim Husb,* 27: 45-54.

Musa, U., Haruna, E. S. and Lombin, L. H. 2008. Quail in the Tropics. National Veterinary Research Institute Vom.NVRI press, Vom.

Ogido, O. C. A. F., Ledoux, I. D. R., Rottinghaus, G. E., Correa, B. l, Butkeraitis, P., Reis, T., Goncales, E. and Albaquerque, R. 2004. Effects of prolonged administration of Aflatoxin B1 and Fumonisin B1 in Laying Japanese quail. *Poultry Science* 83:1953-1958.

Panda, B., and Singh, R. P. 1990. Developments in processing quail meat and eggs. World Poultry *Science Journal*, 46: 219-233.

Sadiq, M. A., Khan, I. A. and Rauf, U. 2006. *Aspergillus fumigatus* in commercial poultry flocks. A serious threat to poultry industry in Pakistan: *J. Anim. Pl. Sci*. 16(3-4).

Saleh, M., Seedorf, J. and Hartung, J. 2007. Inhalable and respirable dust, bacteria and endotoxins in the air of poultry houses. Dust Emission in Agriculture – dust Conference. [accesem Jan. 10 2010]. Available at: http://www.dustconf.org/client/dustconf/ upload/812/hartung. pdf.

Upsher, F. J. and Griffiths, D. A. 1973.Air spore of a site in tropical Queensland Australia. *Trans. Br. Mycol. Soc. 61: 537-545.*

Warcup, J. H. 1950. The soil plate method for isolation of fungi from soil. *Nature,* 166:117-118.

Warnock, D. W. 2006. Fungal diseases: An evolving public health challenge. *Med Mycol.* 44: 697-705.

****