

## CONSUMERS' PERCEPTION ON DIFFERENTLY SPICED HOT-SMOKED CATFISH (*Clarias gariepinus* BURCHELL, 1822)

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### ABSTRACT

Consumers' perception on differently spiced hot-smoked catfish (*Clarias gariepinus* Burchell, 1822) was examined. The experimental design was Complete Randomized Design (CRD) with the treatments been the variously spiced hot-smoked catfish (garlic, ginger, garlic-ginger homogenate spiced and the control without spices) all replicated 12 times. Descriptive (hedonic scale) and discriminative (ranking test) tests were the criteria adopted for the assessment. There was significant difference ( $p < 0.05$ ) the consumers perception of the descriptive qualities of smoked fish products including the odour, flavour and texture as consumer rated the odour of garlic-ginger homogenate spiced hot-smoked catfish as the best, the flavour of ginger spiced was perceived to be the best while the texture of the control was rated to be the best. However, the result of the discriminative test indicated that the difference between the rankings of the four groups of the differently spiced hot-smoked catfish was significant ( $p < 0.05$ ) with consumers having more preference for the control with no spices. It is recommended the new smoked catfish products should be given more publicity so as to arouse consumers' interest.

**Key words:** Consumer perception, Spices, Hot-smoked, *Clarias gariepinus*

### INTRODUCTION

Fish demand is increasing as a result of the increasing world population, higher living standards and the good overall image of fish consumers (Cahu *et al.*, 2004). Fish consumption is not forbidden within religious groups unlike eating dog and pork (Agbelege and Ipinjolu, 2001), as a result fish has been consumed by large proportion of the population and has become a staple diet. With the rising cost of meat and cheese protein foods, consumers have become increasingly interested in fish as a source of dietary protein (Emere and Dibal, 2013). Fish as a whole, has a lot of food potential and can therefore be expected to provide relief from malnutrition, especially in developing countries (Ashraf *et al.*, 2011). It provides superior quality protein to that of meat, milk and eggs and well balanced essential amino acid profile, necessary minerals and fatty acids (Hossain, 1996). In addition to the fact that, fish flesh is tasty and highly digestible; it also minimizes the risk of heart diseases and increases life expectancy (Ashraf *et al.*, 2011). However, as important as fish is, it is highly perishable and thus susceptible to deterioration without any preservative or processing measures (Okonta and Ekelemu, 2005). Due to its chemical composition, fish is a perishable food material and its flavor and texture changes rapidly during storage after death (Emere and Dibal, 2013). According to Clucas (1990), the rate of fish spoilage depends on

handling during processing, acidity level, species of fish, weather conditions, mode of storage and temperature during transportation, while Daramola *et al.* (2007) reported that chemical breakdown of protein, fat and water contents contribute to rapid spoilage of fish. A number of processing techniques are in operation in Nigeria, these include: chilling, freezing, salting, canning, drying and smoking (Kumolu-Johnson *et al.*, 2010), however, smoking is the most popular method of fish processing (Bako, 2005). Fish smoking is particularly relevant in the artisanal fisheries sector in that it prolongs the shelf-life of the fish, enhances flavour and increases utilization of the fish in addition to reducing wastages when catches are good as well as increasing protein availability to rural people (Jallow, 1995). Bakir *et al.* (1993) reported that *Sarotherodon galilaeus*, *Oreochromis niloticus* and *Tilapia zilli* as well as *Clarias gariepinus*, *Clarias anguillaris* and *Heterobranchus longifilis* which belong to the families, Cichlidae and Clariidae respectively are among the species of freshwater fish that are mostly utilized in aquaculture, especially in the developing world. While catfishes of the family Clariidae comprise the most commonly cultivated fishes in Nigeria (Adewumi and Olaleye, 2011), It is established that *Clarias gariepinus* has higher crude protein and lipid than *Oreochromis niloticus* (Ayeloja *et al.*, 2013) thus the need for the use of catfish in this study. Verbeke

*et al.* (2007) reported that health benefits of fish consumption include reducing the risk of heart disease and cancer, improving bone density, making people stronger and smarter, stimulating cerebral development and prolonging life. These benefits of fish and other factors have increased the demand for fish while at retail markets, buyers often want diverse product of fish including live and processed fish in varied sizes and consistent supply Andrew (1997). Consumers' perceptions of fish quality influences fish demand and prices (Trondsen *et al.*, 2003). Thus the need to evaluate consumers' perception of differently spiced hot-smoked catfish.

#### MATERIALS AND METHODS

Forty eight (48) live catfish (*Clarias gariepinus*) were collected by dragging with drag net from an earthen pond of Korede fish farm Omi-Adio second gate Ibadan Oyo state Nigeria. The average weight of the fish was 226±23g, they were conveyed using 2 pieces of 30 litre plastic bowls with 24 fish in each bowl. Fish collection was carried out early in the morning to reduce stress and was transported by road within 43 minutes to the fish processing unit of Federal College of Animal Health and Production Technology (FCAH&PT) Moor Plantation Ibadan where they were slaughtered immediately and smoked. 6kg of dried garlic bulb (*Allium sativum*) and 10kg of dried ginger rhizome (*Zingiber officinale*) was bought from Bodija market in Ibadan Oyo state Nigeria, it was ground using electric grinder where 6kg of garlic bulb produced 5kg of powdered garlic (*Allium sativum*) and 10kg of ginger rhizome produced 5kg of powdered ginger (*Zingiber officinale*), they were then transported to the fish processing unit of Federal College of Animal Health and Production Technology (FCAH&PT) Moor Plantation Ibadan where they were later applied as spices to the fish at ratio 5:100g in accordance with the recommendation of Kumolu-Johnson and Ndimele (2011). 70g each of powdered garlic (*Allium sativum*) and ginger (*Zingiber officinale*) were homogenized in ratio 1:1 manually using hand and were applied as spices on the catfish (treatment four) prior to fish smoking. The experiment was Completely Randomized Design where the treatments were the variously spiced catfish (garlic, ginger and garlic + ginger) with a control (without spices). The 48 catfish samples were slaughtered and prepared in the following sequence: the fish were slaughtered with sharp knife, washed with clean water Immersed in 15% brine spiced with garlic powder in ratio 5:100g of garlic to fish/ginger powder in ratio 5:100g of ginger/ratio 1:1 homogenate mixture of garlic and ginger powder respectively while the control were not spiced spread on wire

gauze placed in the smoking kiln after which smoking was carried out.

Fish smoking was done at the temperature of 90 ± 10 °C for 48 hours using NIOMR (Nigeria Institute for Oceanography and Marine Research) smoking kiln installed in the fish processing unit of the Fisheries Technology Department, Federal College of Animal Health and Production Technology (FCAH&PT) Moor Plantation Ibadan Oyo State Nigeria. Charcoal was used to generate heat and smoke. After smoking, the charcoal was removed and the fish were left for 20hours to cool in the smoking kiln.

#### ORGANOLEPTIC ASSESSMENT

The smoked fish samples were transferred within 5 minutes to the fish processing laboratory of FCAH&PT where both descriptive and discriminative form of organoleptic assessment were carried out on the smoked fish samples using hedonic scale and ranking test respectively. The sensory quality attributes (descriptive test) that were evaluated was based on 5-point hedonic scale modified from Tobor (1994) and Eyo (2001) presented on table 1. Odour, flavour and texture were examined, the following grades were allotted depending on their qualities: 8 ≤ 10 = Excellent, 6 ≤ 8 = Very good, 4 ≤ 6 = good, 2 ≤ 4 = bad and ≤ 2 = worst. After which ranking test (discriminative test) was also carried out, the attributes tested for in the ranking test were odour, flavour, texture and colour acceptance. 12 trained panelists from Federal College of Animal Health and Production Technology Ibadan were used for the assessment.

#### STATISTICAL ANALYSIS

Data collected on descriptive organoleptic assessment using hedonic scale were subjected to nonparametric test (Kruskal Wallis test). While data collected on discriminative organoleptic assessment using ranking test were subjected to cross table analysis using chi square statistics ( $\chi^2$ ). The chi square statistics test the relationships between the observed and the expected frequency of the observation group.

#### RESULT AND DISCUSSION

The result of the odour of differently spiced hot-smoked catfish presented on figure 1 indicates that significant difference ( $p < 0.05$ ) exists between the odour of various spiced hot-smoked catfish with garlic-ginger homogenate spiced rated as having the best odour followed by ginger spiced catfish. Similarly, the result of the flavour presented on figure 2 indicates that significant difference ( $p < 0.05$ ) exist between flavour of the various spiced hot-smoked

catfish with ginger spiced catfish rated as having the best flavour, this agrees with the opinion of Kwangho (2010) that Food attributes is as an important factor in predicting consumers' perceptions in food choices decision, Jang *et al.* (2009) in their recent study of food attributes reported that the satisfaction levels of ethnic foods varies depending on diverse food attributes such as taste, fresh, colorful, uniqueness and healthiness. In related veins, in regard to the effectiveness of food attributes on consumer behavior, it was observed that oyster consumption was mainly influenced by five food attributes, including taste, nutritional value, freshness, cost and safety (Lin, 1991). The fish without spices is rated by consumers as having the best texture and it is significantly different ( $p < 0.05$ ) from other spiced catfish as presented on figure 3.

The results of the discriminative test presented on figure 4, 5, 6 and 7 indicate that the difference between the rankings of the four groups of the differently spiced hot-smoked catfish is significant ( $p < 0.05$ ) with consumers having more preference for the control with no spices, this is because the other spiced catfish are new and the consumers do not have knowledge and experience of them, this is in line with the opinion of Olsen (2004) that knowledge about seafood product is one of the main important factors in seafood choice, Pieniak, *et al.*, (2008) also reported that knowledge about fish product is expected to be highly correlated with consumption of the fish product. However, it is worth noting that food acceptance is most appropriately determined by hedonics at least in the Western world (descriptive organoleptic assessment) (Aslaug, 2000).

#### Conclusion

The study revealed that garlic-ginger homogenate spiced hot-smoked catfish is rated as having the best odour, there was significantly ( $p < 0.05$ ) difference in the flavour of the differently spiced hot-smoked catfish with ginger spiced having the best flavour while the texture of the catfish that has no spices is accepted to have the best texture by the consumers. However, the results of the discriminative test indicate that the difference between the rankings of the four groups of the differently spiced hot-smoked catfish was significant ( $p < 0.05$ ) with consumers having more preference for the control with no spices, this is because the consumers are not familiar with the new products. It is therefore recommended that these new smoked catfish products should be given more publicity and proper packaging to arouse consumers' interest.

#### REFERENCES

- Agbelege, O. O. and Ipinjolu, J. K. (2001). An assessment of the exploitation and management techniques of the fisheries resources in the Nigeria portion of the Lake Chad. *Journal of Arid Zone Fisheries*. 1: 89 – 98.
- Andrew M. L. (1997). Small scale, on-farm fish processing. SRAC Publication No. 442, 4pp. application of the expectancy-value approach. *Appetite* 36(2), 173-186.
- Ashraf, M. A.; Zafar, A.; Rauf, S.; Mehboob and. Qureshi, N. A. (2011). Nutritional values of wild and cultivated silver carp (*Hypophthalmichthys molitrix*) and grass carp (*Ctenopharyngodon idella*). *Int. J. Agric. Biol.*, 13: 210–214.
- Aslaug, H. (2000). Flavor Perception and Volatile Compounds in Fish. Icelandic Fisheries Laboratories. 25 pages.
- Ayeloja, A. A.; George, F. O. A.; Dauda, T. O. Jimoh, W. A. and Popoola M. A. (2013). Nutritional comparison of captured *Clarias gariepinus* and *Oreochromis niloticus*. *International Research Journal of Natural Sciences*. 1(1): 9 – 13.
- Bakir, H.M., Melton, S.L. and Wilson, J.L. (1993). Fatty acid composition, lipids and sensory characteristics of white amur (*Ctenopharyngodon idella*) fed different diets. *J. Food Sci.* 58(1):90-95.
- Bako, W. S. (2005). The role of women in fish processing: Handling and marketing in Kainji Lake basin. Proceedings of 19<sup>th</sup> Annual Conference of the Fisheries Society of Nigeria (FISON), Nov. 29 – Dec 3, 2004, Ilorin Nigeria.
- Cahu, C.; Salen, P.; De Lorgeril, M. (2004). Farmed and wild fish in the prevention of cardiovascular diseases: assessing possible differences in lipid nutritional values. *Nutr Metab Cardiovas.* 14:34–41.
- Clucas, I. J. (1990). Fish handling preservation and processing in the tropics, tropical development and research institute, Clerkenwell Road, London. 184 pages.
- Daramola, J. A.; Fasakin, E. A. and Adeparusi, E. O. (2007). Changes in physicochemical and sensory characteristics of smoke-dried fish species stored at ambient temperature. *African Journal of Food Agriculture Nutrition and Development*. 7 (6): 1 -16.
- Emere, M. C. and Dibal, D. M. (2013). A survey of the methods of fish processing and preservation employed by artisanal fishermen in Kaduna

- city. Food Science and Quality Management. 11: 16 – 22.
- Hossain, M. A. (1996). Proximate and amino acid composition of some potential Bangladeshi fish feed ingredients. *Bangladesh J. Zool.*, 24: 163–168.
- Jallow, A. M. (1995). Contribution of improved Chorkor oven to artisanal fish smoking in the Gambia. Proceedings of the workshop on seeking improvements in fish technology in West Africa, Nov. 7-9, 1994, Congo, pp: 22 - 28.
- Jang, S. S. C., Ha, A., & Silkes, C. A. (2009). Perceived attributes of Asian foods: From the perspective of the American customers. *International Journal of Hospitality Management*, 28 (1), 63–70.
- Kumolu-Johson, C. A.; Aladetohun, N. F. and Ndimele, P. E. (2010). The effects of smoking on the nutritional qualities and shelf-life of *Clarias gariepinus* (BURCHELL 1822). *Afr. J. Biotechnol.*, 9: 73 – 76.
- Kwangho, L. (2010). A study of perceived attributes of Asian foods: Comparison of implicit and explicit attitude measures. A Master of Science Thesis presented to the Faculty of the Graduate School University of Missouri. 103pages.
- Lin, J. (1991). Consumer food attribute perceptions and consumption behavior. *Consumer Interests Annual 1991*.
- Okonta, A. A. and Ekelemu, J. K. (2005). A preliminary study of micro-organisms associated with fish spoilage in Asaba, Southern Nigeria. Proceedings of the 20<sup>th</sup> Annual conference of fisheries society of Nigeria (FISON), Port-Harcourt 14<sup>th</sup> – 18<sup>th</sup> November, 2005. Pages 557 – 560.
- Olsen, S, O. (2004). Antecedents of Seafood Consumption Behavior: An Overview. *Journal of Aquatic Food Product Technology*, 13(3), 79-91.
- Pieniak, Z.; Verbeke, W.; Scholderer, J.; Brunso, K. and Olsen, S.O. (2008). How do affective health-related and cognitive determinants influence fish consumption? A consumer survey in five European countries. *12th Congress of the European Association of Agricultural Economists – EAAE*.
- Trondsen, T.; Scholderer, J.; Lund, E. and Eggen, A. E. (2003). Perceived barriers to consumption of fish among Norwegian women. *Appetite* 41(3), 301-314.
- Verbeke, W., Vermeir, T., Brunso, K. (2007). Consumer evaluation of fish quality as basis for fish market segmentation. *Journal of Food Quality and Preference* 18(4), 651-661.

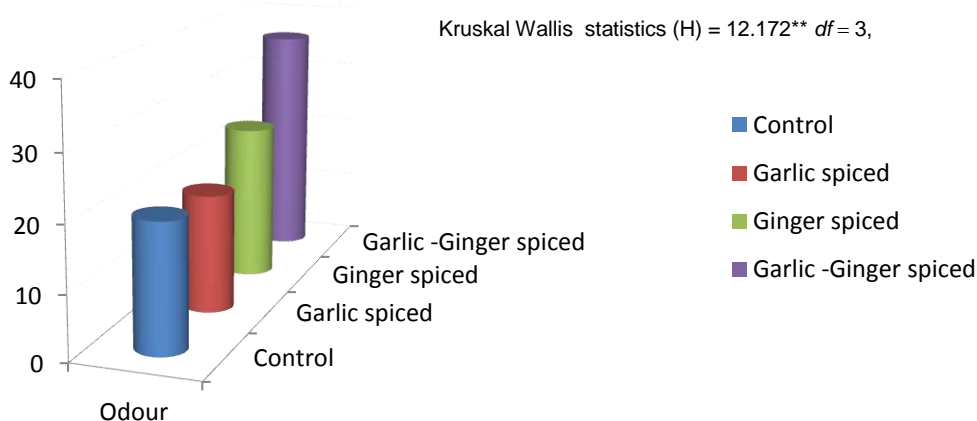


Fig. 1: Descriptive consumers' perception on the odour of differently spiced hot-smoked catfish

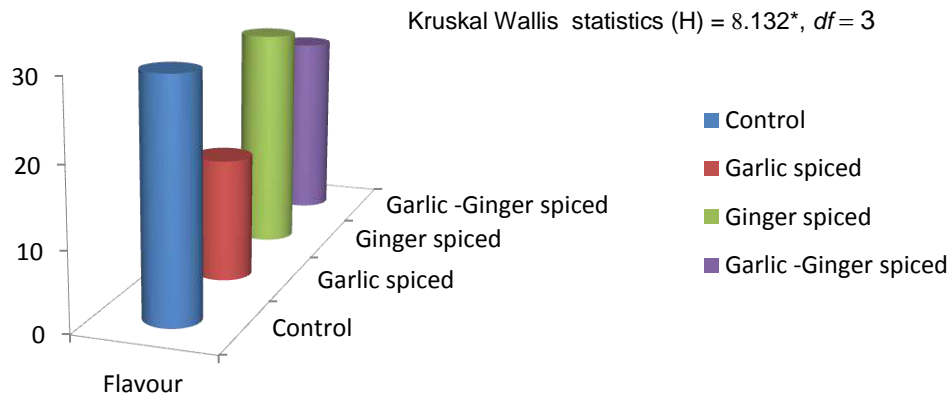


Fig. 2: Descriptive consumers' perception on the flavour of differently spiced hot-smoked catfish

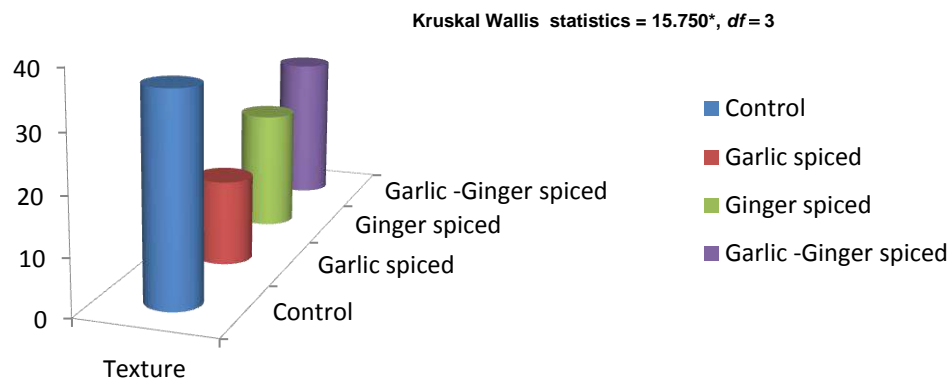


Fig. 3: Descriptive consumers' perception on the texture of differently spiced hot-smoked catfish

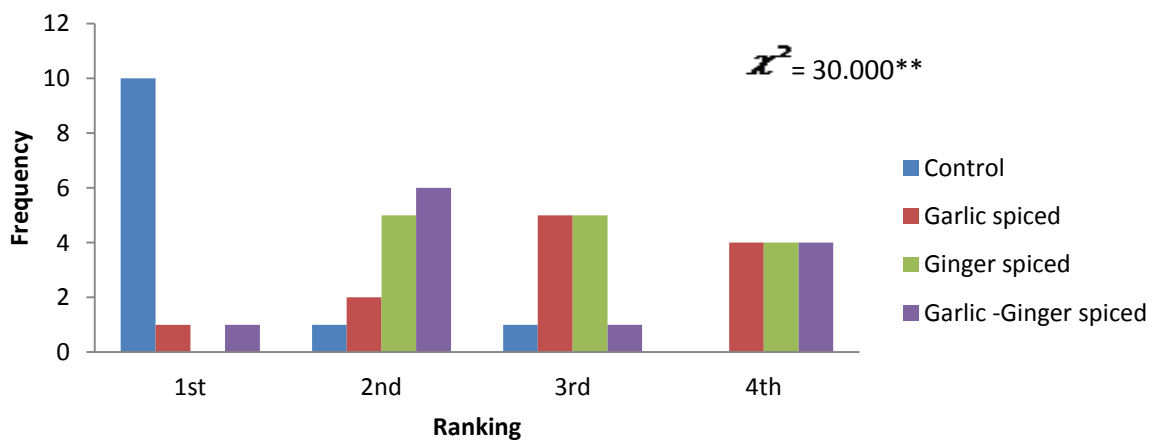


Fig. 4: Discriminative consumers' perception on the odour of differently spiced hot-smoked catfish

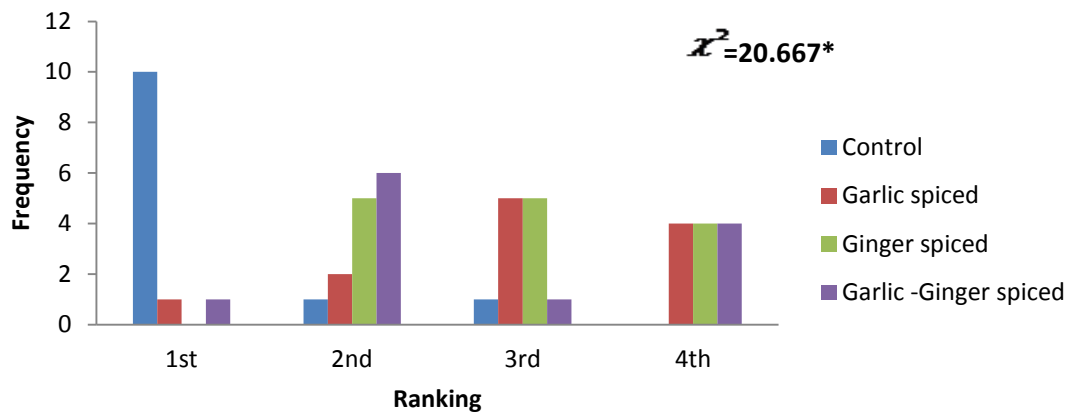


Fig. 5: Discriminative consumers' perception on the flavour of differently spiced hot-smoked catfish

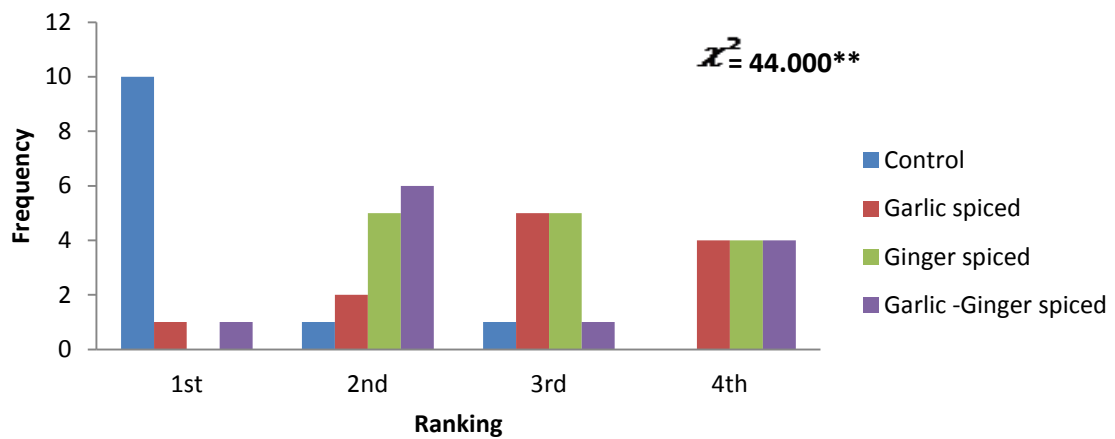


Fig. 6: Discriminative consumers' perception on the texture of differently spiced hot-smoked catfish

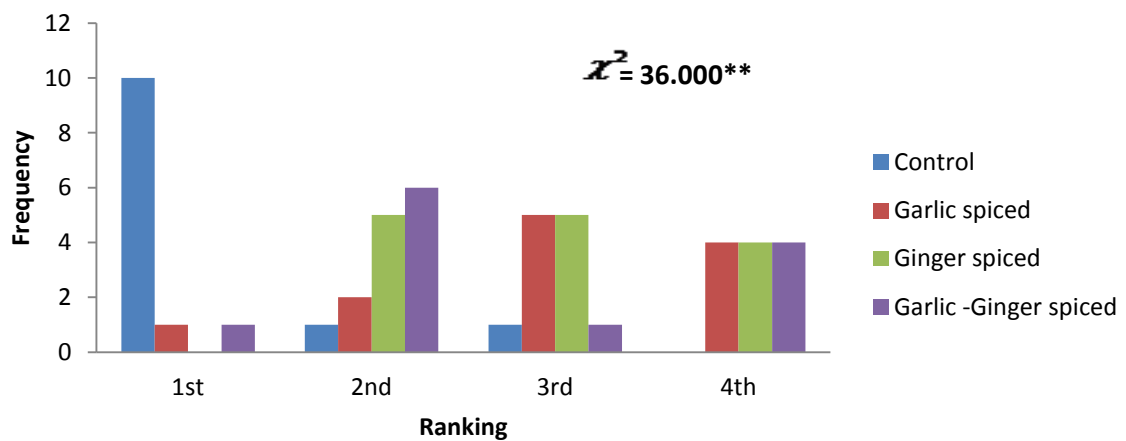


Fig. 7: Discriminative consumers' perception on the colour acceptance of differently spiced hot-smoked catfish