Trend Of Sudan Dye Adulteration on Ghanaian Market and Associated Regulatory Interventions: 2018 -2023

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Introduction

The use of all Sudan dyes as food colourants is prohibited in many countries, due to their carcinogenicity. Sudan dyes are classified by the International Agency for Research on Cancer (IARC) as Group 3 carcinogens and are banned as food additives world-wide due to its health implications. Ghana Standard- GS 223: 2001 (Animal and Vegetable Fats and Oils - Specifications for edible palm oil) does not permit the addition of any additive to modify the colour of the palm oil

In August 2015, routine analysis of palm oil on the Ghanaian markets revealed 96% contamination with Sudan IV dye. This led to the implementation of a series of regulatory interventions to control the adulteration of palm oil with Sudan IV dye.

Objective

This study assessed the trend of palm oil adulteration, from 2018 to 2023, and the associated regulatory interventions implemented in Ghana.

Methods

Sampling

Random sampling of palm oil from the Ghanaian markets were conducted and analysis for Sudan IV dye, from 2018 to 2023. Samples of palm oil were collected from selected major markets within each region in Ghana. Sampling was done at the retail point which are mainly the local markets/retail market.

Interviews

Personal interviews were conducted to ascertain the regulatory interventions implemented and their timelines.

In-depth interviews and focus groups discussions were used to assess the level of understanding of producers, retailers and consumers on the health implications of Sudan IV dye during the various stages of the implementation of intervention.

Laboratory analysis

Palm oil samples were analysed using High Performance Liquid Chromatography (HPLC) with the following conditions; Flow rate: 1.5ml/min, UV detection: 505nm, Mobile Phase: Methanol: Water (85:15), and Column: Phenomenex C8 100A, Luna 5µm, 150×4.6mm

Data processing and Analysis (Statistical methods)

Information on each sample was recorded on Microsoft excel spread sheet. Information captured included Sample code, name of market, location of market, Region, sampling date, type of vendor, origin of palm oil, and presence of Sudan dye. The data was analysed statistically using the appropriate statistical tool (Excel 2016 and EpiInfo 7).

Results

Trend of Palm Oil Adulteration on Ghanaian Market

Percentage contamination of palm oil on the Ghanaian market increased from 7.3% in 2018 to 26.6% in 2019, decreased marginally in 2021(22.9%), increased in 2022 (26.1%) before declining in 2023(8.1%). Greater Accra consistently had the highest level (between 10% and 61%) of adulterated palm oil on their market each year and the Upper West Region consistently had the lowest (0%), except for 2022 (30%). The practice appears to have stopped on markets in the northern part of the country (Figure 1) in 2023 but is still ongoing in markets in the southern part of the country.

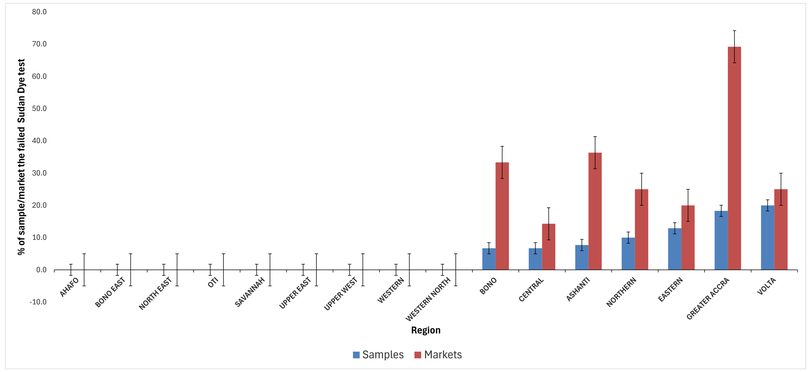

Figure.1: Percentage of contamination and market within the regions engaged in the practice of Sudan dye adulteration in 2023.

Analysis of the effect of the Various Interventions on Palm Oil Adulteration in Ghana

The sanction and education approach resulted in a significant drop in adulteration practices and levels of adulterated palm oil (i.e. from 96% in 2015 to 7.3% in 2018). However, the gains made with the implementation of this intervention did not remain over the years

The deployment of a holistic approach that included education, enforcement/sanctions, and a tracking system yielded the most promising results

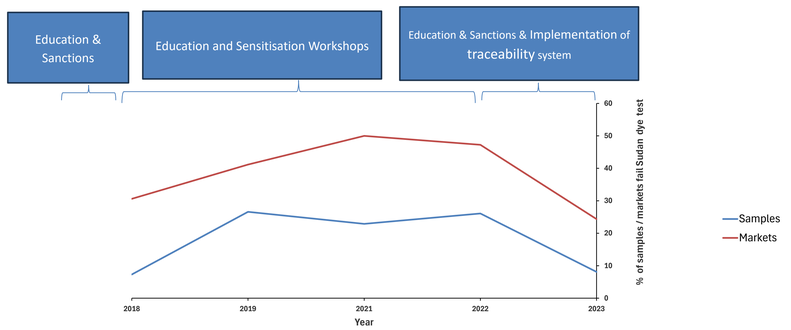

Figure.2: Percentage contamination of palm oil on Ghanaian market and markets involved in adulteration practice at various stages of the regulator intervention..

Discussion

This study has shown that the use of sanctions can drastically halt adulteration practices, however, sanctions cannot sustain or stop the practice entirely. This was observed in the gradual increase in adulteration of palm oil on the Ghanaian market in 2019 when the use of sanctions as an intervention in 2018 was stopped. This study has also shown that the use of education and/or sensitization workshops promoted self-compliance by traders and gradually reduced the palm oil adulteration practices. However, the combination of multiple approaches including sanctions, enforcement and education yielded a much desirable impact on the adulteration of palm oil on Ghanaian market, as observed by the decline in the practice in 2013. This decline could also be attributed to the regulatory interventions implemented This approach is similar to interventions used in the control of food fraud. Various studies have recommended interventions such as education on safety and health implications, strict enforcement, implementation of traceability system from production to retail, frequent monitoring by authorities as some of the ways to control food adulteration

Conclusion

Palm oil adulteration is on the decrease in Ghana especially the northern part of the country. This could be due to the various regulatory interventions implemented by the regulator. However, further studies are needed to establish such an association.

References

1. FDA: FDA Cautions the Public on Palm Oil Adulteration with Sudan Iv Dye. In. www.fdaghana.gov.gh; 2015.
2. FSA: Fovitor International Ltd recalls its Dzomi Palm Oil because it contains the illegal dye Sudan. In: News and Updates. www.food.gov.uk; 2015.
3. Stiborova M, Martinek V, Semanska M, Hodek P, Dracinsky M, Cvacka J, Schmeiser HH, Frei E: Oxidation of the carcinogenic non-aminoazo dye 1-phenylazo-2-hydroxy-naphthalene (Sudan I) by cytochromes P450 and peroxidases: a comparative study. Interdisciplinary toxicology 2009, 2(3):195-200.
4. Amoako-Mensah, J., Assessment of the prevalence of palm oil adulteration with Sudan IV dye in the greater Accra region. 2016.
5. Nyorkeh, R., et al., 18 Year analysis of RASFF notifications on Sudan dye adulterated cases in palm oil (2004 to 2022) and the principles of the technique for its detection. Sustainable Food Technology, 2024.
6. GNA, Palm-oil adulteration: FDA to kick-start traceability system for culprits, in Health, G.N. Agency, Editor. 2022: www.gna.org.gh. p. https://gna.org.gh/2022/07/palm-oil-adulteration-fda-to-kick-start-traceability-system-for-culprits/.

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