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Good Manufacturing Practices Application for Some Groundnuts Oil Expellers in Kordofan Region, Sudan

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Abstract: *The present study was conducted in some groundnut oil expellers in Kordofan region, Sudan. The objectives of this study to assess the application of Good Manufacturing Practice (GMP) in groundnuts oil expellers in Kordofan region. Ten oil expellers were chosen from Elobeid, Elnuhoud, Umroaba and Elrahad towns according to high production level in those towns. Ready to use questionnaire prepared by Primus lab checklist was used. Data were categorized according to GMP manual. Concerning the first part of GMP i.e. good manufacturing practice requirements (GMPR), the results revealed that the general GMP was not applied in all oil expellers, concerning the second part of GMP (good manufacturing practice file requirements (GMPF)), include pest control requirements the score of the studied expellers ranged between 18 – 40 out of 95 degree, for storage area and packaging materials their score ranged between 25 – 37 out of 85 degree, for operation practices the expellers scores ranged 25 – 50 out of 154 degree, for employer practices requirements their score ranged between 19 – 26 out of 79 degree, for equipments and equipments design their score were ranged between 27 – 50 out of 123 degree, for general cleaning requirements their scores ranged between 0 – 44 out of 88 degree, for building and grounds requirements the score ranged between 31 -47 out of 116 degree. The total degree of part one (GMPR) varied from 177 – 257 compared to 663 degree of the standards. Regarding part two (GMPF), for all requirements, all expellers scored zero out of 337 degree. The total evaluation score for application of GMP is 1000 (663 + 337) degree while the audited expellers obtained only ranges of 117 - 257 degrees. It can be concluded that all oil expellers investigated in this study were characterized by inconvenient and unsanitary conditions, therefore, the principals and basics of GMPS were not satisfied considering this system represents the minimum requirement to implemented systems of food safety and quality assurance.*

Key words*: Evaluation, GMP, groundnuts oil expellers, food safety file requirements, Kordofan.*

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I. Introduction

Food safety has become more and more essential both in developed and developing countries due to the expanding food trade, affecting health, economic and sustainability aspects (King *et, al,* 2017). Enhancing food safety in developing countries, such as Sudan, poses more challenges due to the situation of the food companies, especially those of the oil expellers (Purwantiningrum, 2011). The quality of oil remains a challenge to the area, since their production methods is manual. these is a lot of handling of the oil during milling especially during the last step of production in which traditional sieving methods using filter sheets is employed for refining and filtering . The step tends to comprise the quality of the oil that is produced Thus, satisfactory and systematic of physical and chemical properties is required to evaluate and possibly predict how locally produced peanut oils. These conditions emerges due to improper processing of food, lack of awareness and responsibility toward handling and food additive uses, and lack of knowledge upon food preparation and production environment requirements.

Good Manufacturing Practices (GMP) is one of the well-known food safety program, developed by Food and Drug Administration-USA, as a guideline for the food, cosmetics and drug producers, handlers, retailers, etc. (Dias *et,al,* 2012). GMP includes policy, procedures and methods as guidance for complying quality standards and hygiene. These guidelines are located in the Code of Federal Regulations 21CFR part 110 as current GMP in manufacturing, packing or holding human food. It serves as the standard by which the government determines if the food is adulterated (Newslow, 2013). Thus, it is critical that every food manufacturer and distributor understand the regulations and develop systems and programs that prove adherence to the letter of this law (David and Norah, 1991).

Various criteria are included in the standard, including personal hygiene, food production facilities sanitation and design, process control and pest control. These criteria are qualitatively described in the standard and used as the basis for GMP compliment assessment. This study focused on assessing the real condition of groundnut oil expellers in Kordofan region based on GMP criteria issued by Primus lab (2011). This can be very important for setting up the basis understanding for the real condition of groundnuts oil expellers and hence the actions plan of the sequential steps to achieve food safety for both the government agencies and the food companies.

General objective:

The general objectives of this study to assess the application of Good Manufacture Practices (GMP) in groundnuts oil expellers in Kordofan region.

Specific objectives:

To investigate weak points, gaps and problems that limit proper implementation of GMP systems in edible oil expellers in Kordofan region.

Evaluation elements of Good Manufacturing Practices (GMPR) and Food Safety files requirements (FSFR).

Evaluation total score of which elements of Good Manufacturing Practices Requirements (GMPR) and Food Safety Files Requirements (FSFR) and compared with GMP standards scores.

II. Materials and Methods

Oil expellers:

Ten Groundnut oil expellers located in Kordofan region were selected, include Shikan (Five expellers), Elnuhoud (Three expellers), Elrahad (One expeller), and Um Rowaba (One expeller). Expeller codes were applied rather than actual expeller names of each oil expellers to protect the reputation of the expeller. Numerical scores were given to sanitary observation on 5 classes of complimentary condition: 5- full compliance, 4- minor deficiency, 3- major deficiency, 2- non compliance and 1- not applicable. These classifications were developed accordingly to the issued standards criteria.

Data collection:

The data collection was done through observation checklist and direct interviews with top management and senior managers in production line. Ten visits were carried out to expellers to verify the application and maintenance of Good Manufacturing Practice (GMP) in groundnuts oil expellers in Kordofan region based on the standard issued by Primus Lab and Global Food Safety (GFS) and evaluation of each expeller performance was documented.

Assessment of Good Manufacturing Practices (GMP):

Audit Checklist:

This assessment was carried out by using the Audit Checklist as prepared by Primus Lab (2011) updated 2013. Scoring system was used to evaluate the two sections of GMP as follow in tables 3.1and 3.2.

Table 3. 1: Scoring system for questions in Section (1) and Section (2) in GMP

Possible answer	Possible Points for the question			
Total compliance	15 points	10 points	5 points	3 points
Minor deficiency	10 points	7 points	3 points	2 points
Major deficiency	5 points	3 points	1 points	1 points
Non-compliance	3 points	0 points	0 points	0 points
Not applicable	0 points	0 points	0 points	0 points

Primus lab (2011, 2013)

Table3. 2: Compliance for questions in GMP option:

Answer	Criteria used
Total Compliance	To meet the question and/or compliance criteria in full.
Minor Deficiency	To have minor deficiencies against the question and/or compliance criteria. To have single or isolated non-severe deficiencies (usually up to three) against the question and/or compliance criteria. To have covered most of the question compliance criteria, but not all.
Major Deficiency	To have major deficiencies against the question and/or compliance criteria. To have numerous non-severe deficiencies (usually more than three) against the question and/or compliance criteria. To have single or isolated severe deficiencies against the question and/or compliance

	criteria. To have covered some of the question compliance criteria, but not most of criteria.
Non-compliance	To have not met the question and/or compliance criteria requirements at all. Having systematic deficiencies against the question and/or compliance criteria (severe or Non-severe issue).
Not applicable	The requirement described in the question is not applicable for the operation being Audited. Justification should be provided in the auditor's comments. Be aware that there Are some questions that do not allow to answer Non-applicable.

Table 3.3: Audit scoring summary

Criteria	(percentage / category)
Superior	95-100 %
Excellent	90-94 %
Good	85-89 %
Standard	80-84 %
Unsatisfactory	Less than 80 %

Section (1) Good manufacturing practices requirements:

These are general food safety, pest control, storage area and packaging material, operation practices, employee practices, equipment, equipment cleaning, general cleaning and the building and grounds.

Section (2) Food safety files requirements:
These included general file requirements, chemical file, pest control file, self inspection file, maintenance and sanitation file, personnel file, microbial test and temperature control file.

Statistical Analysis:
The quantitative collected data was entered and analyzed by using Statistical Packing for Social Sciences (SPSS) version 16.

III. Results and Discussions

Total Score of good manufacturing practices requirement GMPR for ten groundnut oil expellers in Kordofan region

The mean score of general good manufacturing practices in all Kordofan Expellers

Was zero% as a result from all general requirements of good manufacturing practices was not implemented in all expellers. The mean score of pest control in all Kordofan Expellers was 31.9. The highest score was 40 in E3 and the lower score was 18 recorded in E6 and E8. The major deficiency in this is requirement mean that all oil expellers studied not have pest control program. The mean score of storage areas and packaging material in all Kordofan Expellers was 33.5. The highest score was 37 in 1E, E3 andE4, while the lower score was 25 recorded in E5. The mean score of operational practices was 36.7. The highest score was 50 in E5, while the lowest score was 25 recorded in E9. The mean score of employee practices was 22.5. The highest score was 26 in E10, while the lowest score was 19 recorded in E6. The mean score of equipments and cleaning was 34.9. The highest score was 50 in E1, while the lowest score was 27 recorded in E9. The mean score of general cleaning was 11.5. The highest score was 44 in E3, while the lowest score was 0 recorded in E5. The mean score of building and ground was 34.1. The highest score was 47 in E1, while the lowest score was 31 recorded in E4. The mean of total score was 192.2 out of 1000 score established by brimus lab. The highest total score was 275 in E3, while the lowest total score was 177 recorded in E8 out of 1000 score.

Food files requirements of oil expellers in North Kordofan:

Concerning the food safety files requirements of oil expellers in Kordofan region the result showed all food safety files requirements (i.e. General File requirements, chemical file, pest control file, self inspection file, maintenance and sanitation file, personnel file, microbial test file, and temperature control file) were not found i.e., not applicable in all expellers (Table 2). Due to lack of these requirements each expeller had lost all the degrees of food safety files requirements established by brimus lab (i.e. 337 degrees).

Question response summary of Good Manufacturing Practices

The questions dealing with Good Manufacturing Practices Requirements for all expellers score full compliance ranged between 10-20 out of 97 questions, these result mean the expellers were meet non compliance criteria in full, minor deficiency ranged 8-14 out of 97 questions, these result mean the expellers were covered most of the compliance criteria, but not all, major deficiency 2-9 out of 97 questions, these result mean the expellers were covered some of the compliance criteria, but not most of criteria, non compliance 24-27 out of 97 questions, these result mean the expellers not meet compliance criteria requirements at all, and not

applicable score 41 out of 97 questions, these result revealed that The requirement described in the question is not applicable for the operation being Audited.

It can be concluded that the most of the questions were not applicable flowed by non compliance as a resulted from gaps, weak points and absence in elements of GMP in oil expellers when comparing with standard established by brimus lab requirements. In the same manner the questions regarding with food safety files requirements scored not applicable for all oil expellers studied in present work (Table 3).Theses result indicated that the top management and senior managers in all expellers oil were not care about important of food safety files requirements.

Audit scoring summary of Good Manufacturing Practice

Table 4 showed that the mean total score of Good Manufacturing Practices in all expellers in this study was 221.7points (22.11%) the highest score recorded 357points (35.7%) in E_2 and the lowest score obtained 177 points (17.7%) in E8, out of 1000 points. This result means that all oils expellers in Kordofan region were unsatisfactory when comparing with reference categorize of brimus lab.

Table 1: Total Score of good manufacturing practices requirement GMPR for some groundnuts oil expellers in Kordofan region

Requirements	Score	E_1	E_2	E_3	E_4	E_5	E_6	E_7	E_8	E_9	E_{10}	Mean
General GMP	45	0	0	0	0	0	0	0	0	0	0	0
Pest control	95	37	37	40	33	37	18	33	18	33	33	31.9
Storage areas	85	37	30	37	37	25	35	35	28	33	33	33.5
Operational practices	154	35	36	40	35	50	40	35	40	25	31	36.7
Employee practices	79	25	21	21	24	20	19	22	25	22	26	22.5
Equipments and cleaning	123	50	42	47	30	31	30	30	30	27	32	34.9
General cleaning	88	18	11	44	10	0	4	10	1	4	8	11.5
Building and ground	116	47	44	46	31	39	37	33	35	46	43	34.1
Total score	**785**	**249**	**221**	**275**	**200**	**202**	**183**	**198**	**177**	**190**	**204**	**192.2**

E1toE10representedexpellersaudited.

Table 2: Food safety files requirements of some oil expellers in Kordofan region.

			Condition					
File	N of Q	T.S	number of expellers	Full compliance %	Minor deficiency %	Major deficiency %	Non Compliance %	Not applicable %
General	6	53	10	0	0	0	0	100
Chemical	3	23	10	0	0	0	0	100
Pest Control	3	35	10	0	0	0	0	100
Self Inspection	12	93	10	0	0	0	0	100
Maintenance and Sanitation	8	65	10	0	0	0	0	100
Personnel	4	23	10	0	0	0	0	100
Microbial Test	4	25	10	0	0	0	0	100
Temperature Control	2	10	10	0	0	0	0	100
Total Score	**42**	**337**	**-**	**0**	**0**	**0**	**0**	**-**

N. of Q = number of questions.
T.S = Total score

Table 3: Question response summary of Good Manufacturing Practices Requirements (GMPR) and food safety files requirements (FSFR) of some oil expellers in Kordofan region.

Expeller code	Good Manufacturing Practices Requirements (97 Question; 663 Points)				
	Full compliance	Minor deficiency	Major deficiency	Non compliance	Not Applicable
E1	19	9	3	25	41
E2	20	8	2	24	41
E3	16	8	7	25	41
E4	11	11	7	26	41
E5	15	8	6	27	41
E6	13	10	8	25	41
E7	10	14	8	24	41
E8	12	11	6	27	41
E9	11	12	8	25	41

E10	16	8	9	25	41

E1 to E10 represented expellers audited.

Table 4: Audit Scoring Summary Good Manufacturing Practices Requirements (GMPR) and food safety files requirements (FSFR) of some oil expellers in Kordofan region.

Expellers code	GMPR Score		FSFR Score		Total score (out of 1000points)	
	Points	%	Points	%	Points	%
E1	249	24.9	0	0	249	24.9
E2	357	35.7	0	0	275	27.5
E3	245	24.5	0	0	245	24.5
E4	200	20.0	0	0	200	20.0
E5	202	20.2	0	0	202	20.2
E6	193	19.3	0	0	193	19.3
E7	198	19.8	0	0	198	19.8
E8	177	17.7	0	0	177	17.7
E9	19	19.0	0	0	190	19.0
E10	206	20.0	0	0	206	20.0

Category 80 < unsatisfactory, Category 80─84 standard, Category 85─89 Good , Category 90─94 excellent and Category 95─100 superior.

IV. Conclusions and Recommendations

The study concluded that the oil expeller's owners, supervisions and employees lack the knowledge of good manufacturing practices system.

It was found that there are wide gaps and weakness points in the elements of GMP system, moreover, the documentations concerning with GMPS are not implemented in all expellers studied.

The research indicated that all the stages of manufacturing processes i.e. raw materials delivery, storage, preparation, milling, packaging, labeling, storing and distribution are not carried out in good sanitary conditions. All assessed oil expellers in these study were not satisfactory the GMP requirements.

Due to considerable gaps, weakness in elements of GMP as well as lack of quality control laboratories, it was found that both the raw material (Groundnuts seeds) and the final product (oil) are non conformances according to international and local standards and specifications. The assessment and application of GMP in other fields of food processing plants in Kordofan region, is needed in future work as recommended point of view.

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References

[1]. **AIB (2013).**American Institute of Planking, International Consolidated Standards for Inspection, Prerequisite and Food Safety Programs, United Studded. ISBN 9781-880877-02 - 13.1.

[2]. **Alli, I (2004).** Food quality assurance principle and practice Pp: 34-36 CRC Press LLC, USA.

[3]. **Basavaraj, K and Nonwage, M (2008).**GMP and cGMP Considerations, Department of Pharmaceutics, KLE University, Belgaum. ISBN 590010.

[4]. **David, A. S, Norah, F. S (1991**). Principles and Practices for the Safe Processing of Foods Butterworth-Heinemann Ltd Oxford UK 456

[5]. **Dias, M .A. C; Sant'Ana, A. S; Cruz; A .G; José de assis, F; De oliveira, C .A. F and Bona, E (2012**). On the implementation of good manufacturing practices in a small processing unity of mozzarella cheese in Brazil, Food Control. 24 1–2 199–205.

[6]. **FDA (2000).** Food and Drug Administration Guidance for Industry: Action Levels for Poisonous or Deleterious Substances in Human Food and Animal Feed. Www. Accessed on 1th August 2013.

[7]. **GFS (2013).** Global Food Safety, GMP Audit Checklist. Edition v1.2, Santa Maria, CA 93455.

[8]. **Gunstone, F. D (2002).** Vegetable oils in food technology: Composition, properties and uses, Blackwell Publishing Ltd., CRC Press, Oxford, UK, pp. 352.

[9]. **Huss, H.H (2011).** Assessment and management of seafood and quality, Prerequisites to HACCP, Food and Agriculture Organization (FAO), fisheries technical paper 444, Rome, Italy.

[10]. **King, T; Cole, M; Farber, J M; Eisenbrand, G; Zabaras, D; Fox, E. M and Hill, J .P (2017).** Food safety for food security: Relationship between global megatrends and developments in food safety, Trends Food Sci. Technol. 68 160–175.

[11]. **Ministry of Industry, Republic of Sudan (2008).** Manual of Good Manufacturing Practice for Oil Manufacturing, Khartoum, Sudan.

[12]. **Nautiyal, P. C (2002).** Groundnut: Post-harvest Operations. Edited by Mejia, D. and Lewis, B, National Research Centre for Groundnut (ICAR), India.

[13]. **Newslow, D (2013**). Food Safety Management Programs CRC Press Boca Raton USA 364

[14]. **PAHO (2002).** Pan American Health Organization, Nutrition unit code of practice for food premix operation, Washington, DC. ISBN 9275125899
[15]. **SCIA (2003).** Sudanese chambers of industries association, oil and soap sector, the union of industries, Khartoum, Sudan.
[16]. **Steele, E.A and Robert, D (2004).** Understanding and Measuring the Shelf-Life of Food. Woodhead Publishing in Food Science and Technology Series. Woodhead Publishing New York, p. 136. ISBN 1855737329.
[17]. **Purwantiningrum, I (2011).** Production process control in small-scale Tempe chips industry phase I: field observation, *J. Agric. Food Technol. 1 9149–152.*

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