

OPTIMUM DRYING TIME FOR PALM NUTS FOR EFFICIENT NUT CRACKING IN SMALL SCALE OIL PALM FRUIT PROCESSING MILLS

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ABSTRACT

Palm kernel, one of the end products of oil palm fruit processing is recovered by the cracking of the palm nuts which is first dried to aid efficient kernel recovery. In small-scale mills palm nuts are air-dried. This paper investigates the optimum drying time necessary for efficient nut cracking. Such factors as wholeness of kernel, splitting of kernel and attachment of shell to the kernel after nut cracking were used for assessing efficiency of nut cracking. The results indicated that four weeks of air drying, which gave 86% whole kernels and 8% split kernels, is the optimum drying time.

Key Words: kernels, drying, split, optimum, loosening, cracking.

INTRODUCTION

The primary products of oil palm fruit processing are palm oil and palm kernel. Palm kernel is particularly valuable because of the oil, palm kernel oil, which is recovered from it. Palm kernel oil has been shown to have similar fatty acid constituents as coconut oil and so is used to replace the latter in laundry and toilet soap formulations (Kifli, H. and Krishna, S. 1987). Palm kernel cake which is the by-product of kernel oil extraction is used for compounding animal feed.

Palm kernel represents only 4 to 6 percent of the fresh fruit palm bunch and is only 10 to 15 percent of the value of the primary products of oil palm fruit processing and is thus of secondary importance (Turner, P.D. and Gillbanks, R.A. 1975; Hartley, C.W.S. 1977). The cost of kernel recovery equipment and its operating costs have been estimated to be about 50 percent of that for palm oil recovery (Hartley, C.W.S. 1977). The flow diagram for palm kernel recovery is shown in Figure 1 and for medium and large scale mills, the equipment used for this process are fully automated (Maycock J.M 1975; and Gebr-Stork, 1963). Small scale oil mills are however typified by low level of automation and a high level of manual transport of material.

The palm kernel recovery equipment commonly found in small scale oil mills apart from the nut cracker are often in the following equipment combination; the nut-fibre separator and the steam heated nut drying floor; the steam heated nut drying floor, and the kernel shell separator; the nut-fibre separator, the steam heated nut drying floor and the kernel shell separator (SOCFINCO, 1984). The steam heated nut drying floors are no more in vogue because

they make additional demand on the steam boiler units which have to cope with providing steam for fruit sterilization, heating of the digester and oil clarification. Since the early 1980's the NIFOR model of the small scale oil mills has been the vogue in Nigeria and this class of mills sterilize fruits at atmospheric pressure with nut drying accomplished in sheds. Kernel loosening from the surrounding shell which is in part achieved when fruit sterilization is effected at a pressure of about 3 bar (Gebr-Stork, 1963), is completely eliminated with the use of this class of mills. For this class of mills and all mills, which sterilize fruits at atmospheric pressure, loosening of the kernel from the surrounding shell is achieved in the nut-drying step. Partial and incomplete loosening of kernel from the shell results to poor nut cracking (Maycock, 1975) giving rise to a high percentage of uncracked nuts split kernels and partially cracked nuts in the cracked nut mixture. The quality parameters for palm kernels are that split kernels should not exceed 4% and foreign matter including shells must be less than 2%. (Turner, and Gillbanks, 1975).

This paper therefore reports on the investigations into the cracking effect resulting from the cracking of air-dried palm nuts obtained from small-scale palm mills.

EXPERIMENTAL WORK

The palm nuts used for this work were obtained from the small scale oil palm fruit processing mill located in NIFOR, Benin City. The nuts were a mixture of dura and tenera. The nuts sifted from the palm press cake immediately after the processing operation were spread out to a depth of about 75mm in a well aired shed to dry.

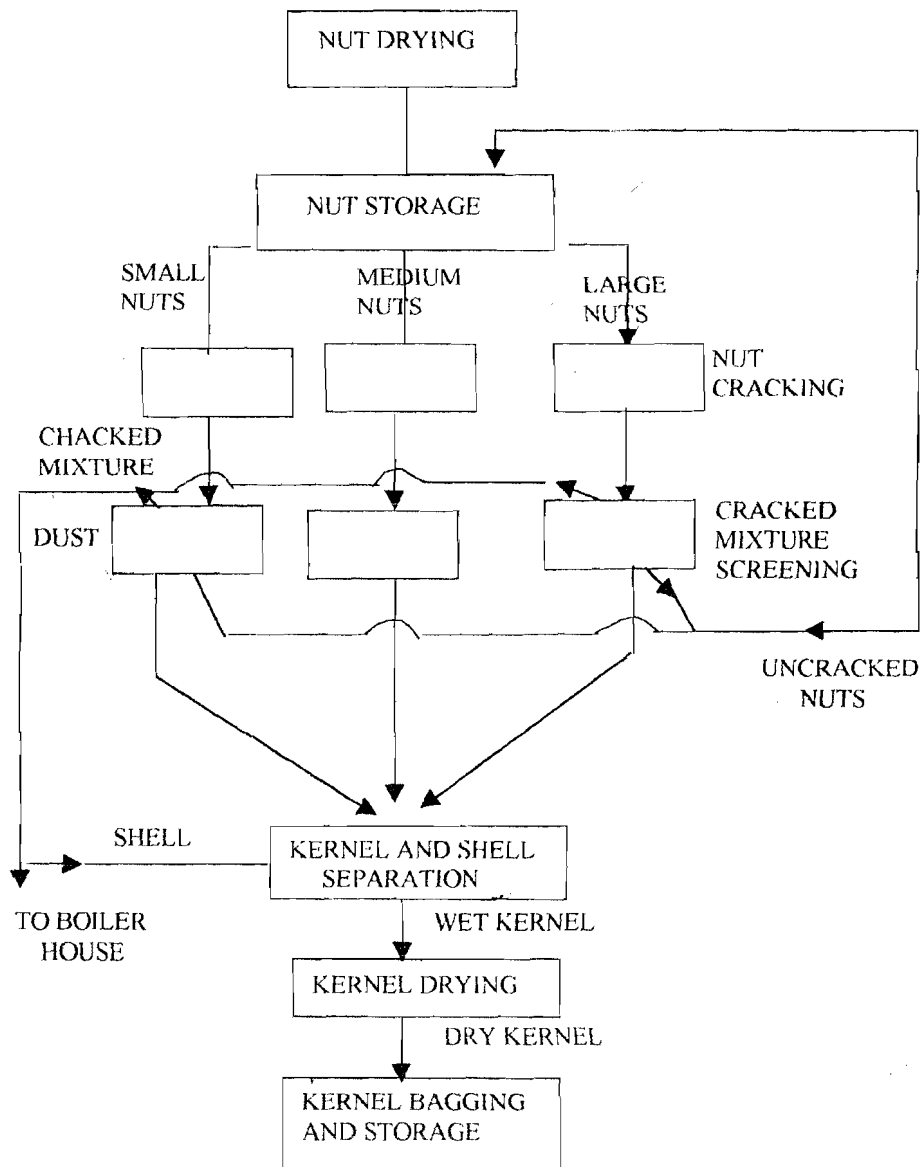


FIGURE 1: PROCESS FLOW DIAGRAM FOR PALM KERNEL RECOVERY

Nuts sampled for cracking were thoroughly scraped of fibre strands. A four litre size container was used for scooping up the nut which were then thoroughly mixed after which fifty nuts were randomly selected and cracked. Four lots of nuts each lot comprising fifty nuts were used for each class of tests. Nut cracking was effected by use of a falling weight to impact on the nuts. A drop height of 340mm with a mass of 876 grammes was used as described Babatunde and Okoli, (1988).

After cracking, each nut was examined and categorised as either fully cracked (FC) in which case the kernel was whole and free of shell attachments; or partially cracked (PC) meaning that there was some shell adhering to the kernel or split and loosely attached (SLA) in this case the kernel was cracked or split into two or more parts but free of any shell attachment; or split and

rigidly attached (SRA) meaning the kernel was split in two or more parts but with shell attachments; or not cracked (NC) in this case the shell had not been cracked at all. The outlined tests were carried out on the day of processing termed day '0' and subsequently on the 7th, 14th, 21st, 35th and 42nd day counting from day '0' corresponding to week 0, 1, 2, 3, 4, 5, and 6 respectively. Since the sole aim of the experiment was to determine the optimum drying period for optimum nut cracking, no attempt was made at grading the nuts.

RESULTS AND DISCUSSIONS

A summary of the results of the nut cracking tests is given in Table 1. For a given nut cracking cycle, split kernels having shells rigidly attached on them and uncracked nuts do not

Table 1 Summary of Observed Effects on Nuts subjected to Cracking after given periods of Air Drying.

WEEK \ OBSERVATION	0	1	2	3	4	5	6
FC	3	12	19	21	43	42	42
PC	12	2	3	3	2	3	4
SLA	0	26	21	20	4	4	3
SRA	28	8	4	4	0	0	0
NC	7	2	3	2	1	1	1

Table 2: Analysis of Results of Nut Cracking to show the Cracking Effect in Percentage.

WEEK \ OBSERVATION	0	1	2	3	4	5	6
FC	6	24	38	41	86	84	84
FC+SLA	6	76	80	82	94	92	90
PC	24	4	6	6	6	6	8
NC+SRA	70	20	14	12	2	2	2

contribute to the cracking effect which is defined as the percentage of completely cracked nuts with regard to the total quantity of nuts charged to the cracker (Gebr-Stork 1962). Partially cracked nuts introduce foreign matter into the kernel and so are undesirable, thus in kernel recovery units every attempt is made to eliminate or as much as possible reduce their presence. Whole kernels and split kernels without shell attachment have been used for computing the cracking effect in this paper.

It is noted in Table 2 that the cracking effect is at a peak in the fourth week of nut drying at 94% with whole kernels contributing 86%. In the fifth and sixth weeks, the cracking effect is 92% and 90% respectively with whole kernels contributing 84%. The least incidence of partially cracked nuts at 4% occurs in the second and fourth weeks of air drying. As from the fourth week of air drying, it is possible to recover all the cracked nuts since non of kernels either whole or split had shell attachment. The only source of loss being uncracked ones amongst the lot subjected to cracking.

The importance of these results lie in the fact that small scale oil palm fruit processors can now for certain know how long to air dry their nut in order to obtain efficient nut cracking. This would also help them determine the space required for storage of the palm nuts before cracking commences.

CONCLUSION

From the results of this investigation the following conclusions can be made:

- (i) The optimum period of air drying of nuts for optimum recovery off palm kernel in small-scale oil mills is four weeks.
- (ii) At four weeks of air drying the cracking effect obtained from the tests was highest at 94% with whole kernels contributing 86%.
- (iii) Small scale palm oil processors can effectively work out and plan the space requirements for air drying of palm nuts from their mills.

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