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FATTY ACID COMPOSITION OF OIL FROM THREE *MUCUNA* BEAN VARIETIES FROM NIGERIA – A SHORT REPORT

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Fatty acid composition of three *Mucuna* beans varieties, *M. cochinchinenses*, *M. utilis* and *M. pruriens* (var IRZ) are reported. Fatty acids levels in the *Mucuna* seed oils were comparable, except that erucic acid (C22: 1n-9) occurred only in *M. cochinchinenses*. With reference to soybean, *Mucuna* seed oils were higher in total saturated fatty acids but lower in total unsaturates. It was concluded that *Mucuna* seeds could be exploited for oil and the by products used for livestock feeding.

INTRODUCTION

The addition of new sources of edible oils to the national food supply could measurably reduce the current shortages and high prices of traditional oils [Vietmeyer & Janick, 1996]. This is especially more important in the sub-Saharan Africa where serious food shortages due to population growth have been widely reported [FAO, 2002; Sadik, 1991]. However, such novel sources need to be thoroughly evaluated for their chemical, nutritional and toxicological properties before being used as supplementary oils for animal or human consumption [Longvah *et al.*, 2000].

In evaluating the nutritional quality of oils, fatty acid composition occupies a special place in view of the fact that certain fatty acids are linked to hyperlipidemic and cholestermic effects in the body. Saturated fatty acids have a more hyperlipidemic effect than the saturated fatty acids [Goode *et al.*, 1995].

Mucuna is an herbaceous legume, which has proven to be excellent green manue/cover crop [Carsky *et al.*, 1998]. Reports to date on its chemical and nutrient composition show that it compares favourably to commonly consumed grain legumes [Ezeagu *et al.*, 2003; Eilitta *et al.*, 2003]. However, most *Mucuna* types have pods that are covered with velvety hairs that irritate the skin. Additionally, toxic constituents in the seeds have been reported, 3,4-dihydroxy-L-phenylalanine (L--DOPA) being the most potent. These factors have limited its use and adoption to date and as a result a lot of the seeds go into waste. This study seeks to evaluate further the nutritional potential of *Mucuna* seed focusing the oils extracted from three *Mucuna* varieties compared to the traditional soybean.

MATERIALS AND METHODS

Matured *Mucuna* seed samples were collected from IITA, Ibadan, Nigeria, processed as previously described [Ezeagu *et al.*, 2002]. Lipds were extracted from the seeds with petroleum ether (boiling point 40–60°C) in a Soxhlet extractor. Soybean was added for comparison. The lipid extracts were transmethylated with trimethylsulfonium-hydroxide (TMSH) as outlined by Litchfield [1972]. The fatty acid methyl esters were analysed by gas chromatography using a GLC (model Shimadzu, GC-15A) equipped with a flame-ionization detector and a 3 m capillary column (i.d. 0.5 mm) (15% DEGS on chromosorb WAW 60–120 mesh). The initial column temperature was 180°C (isothermal). The injection temperature was 220°C and the detector temperature was 230°C. Nitrogen was used as the carrier gas. Peak areas were integrated using CR-3A Data Processor Software, and the fatty acids were identified by comparison of their retention time with those of known standards. All analyses were done in duplicate.

RESULTS AND DISCUSSION

Crude lipid contents are displayed in Figure 1 and fatty acid profiles are shown in Table 1. Oil yields from the three *Mucuna* varieties were low and on the same level (4.19–4.99 g/100 g). *Mucuna* is obviously not an oil seed and inferior to soybean in oil content. Palmitic (C16:0) and stearic (C18:0) acids, ranging between 18.01–20.86 and 8.43–13.52% respectively are the predominant saturated fatty acids in the *Mucuna* seeds. A similar trend occurs also in the soybean oil. Palmitic acid levels in *Mucuna* seeds are on the same level and higher than levels in the reference seeds. Oleic (C8:1n-9), linoleic (C18:2n-6) and linolenic (C18:3n-3) acids are the dominant unsaturated acids, making up to 58.51, 60.62 and 58.86% of the total fatty acids in *M. utilis*, *M. cochinchinesis* and *M. pruriens* (IRZ) respectively. Stearic acid was lower in *M. utilis* (8.43%) than in *M. cochinchinenses* and *M. pruriens* (IRZ) (13.52 and 12.29%, respectively). Erucic (C22:1n-9) acid occurred only in *M. cochinchinenses*, while gadoleic (C20:1n-9) acid occurred only in IRZ. Ligoneric acid was not

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detected in IRZ, while about the same amounts of the acid occurred in *M. cochinchinenses* and *M. utilis*.

Mucuna seed oils were inferior to soybean in the content of unsaturated fatty acids as the U/S ratios. Behenic (C22:0), which occurred also in soybean, was only detected in *M. pruriens* (IRZ). Erucic occurred only in *M. cochichinensis* (1.47%) in low amounts and thus constitute no nutritional disadvantage. *Mucuna* seed oil seems to fall within the group of semidrying oils [Bailey, 1951; Eromosele *et al.*, 1994]. Such oils are rich in oleic and linoleic acids and thus make good edible oils. They are also high in linolenic acid and demonstrate a high degree of unsaturation.

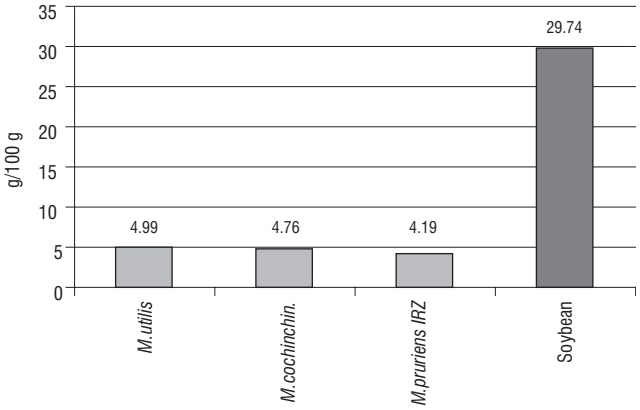

FIGURE 1. Oil content of *Mucuna* seeds as compared to soybean.

TABLE 1. Fatty acid composition of *Mucuna* seed oils compared to soybean (% of sum)*.

Fatty acids	*M. utilis*	*M. cochinchinesis*	*M. pruriens* var *IRZ*	Soybean
$C_{14:0}$	-	-	-	0.1
$C_{16:0}$	20.86	18.01	20.0	10.6
$C_{16:\ 1n-9}$	-	-	0.1	0.1
$C_{18:0}$	8.40	12.22	12.29	4.0
$C_{18:\ 1n-9}$	13.91	14.33	14.38	23.3
$C_{18:\ 2n-6}$	44.60	42.38	44.48	53.7
$C_{18:\ 3n-3}$	4.0	3.96	5.31	7.6
$C_{20:0}$	2.28	2.05	2.54	0.3
$C_{20:\ 1n-9}$	0.96	-	-	-
$C_{22:0}$	-	-	0.94	0.3
$C_{22:\ 1n-9}$	-	1.47	-	-
$C_{24:0}$	5.04	4.67	-	-
Total saturated[a]	36.58	37.95	35.73	15.3
Total unsaturated[b]	63.47	62.14	64.27	84.7
Total polyunsaturated[c]	48.6	46.34	49.79	61.3
U/S ratio[d]	1.7	1.7	1.8	5.5

*Means of two independent analyses; [a]Sum of all saturated fatty acids; [b]Sum of all unsaturated fatty acids; [c]Sum of all polyunsaturated fatty acids; [d]Sum of unsaturated/Sum of saturated; – not detected.

Mucuna bean has not been put into much nutritional use mainly due to the high DOPA content and as a result, large quantities are going into waste. Fatty acid profile shows appreciable levels of unsaturated fatty acids. A possible avenue for its utilization could be *via* oil extraction.

CONCLUSION

Due to the low oil content, extraction of oil from *Mucuna* could be explored after the cost effectiveness is considered. There would be the added advantage that the by products could be used for livestock feeding.

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