



The Role of AGRICULTURE in POVERTY ALLEVIATION

Edited by

M. M. Abubakar

T. A. Adegbola and I. S. R. Butswai



Mrs Kemi Akande
School of Agric

THE ROLE OF AGRICULTURE IN POVERTY ALLEVIATION

PROCEEDINGS OF THE 34TH ANNUAL CONFERENCE
OF THE AGRICULTURAL SOCIETY OF NIGERIA,
HELD AT ABUBAKAR TAFAWA BALEWA
UNIVERSITY, BAUCHI OCTOBER, 15TH - 19TH 2000.

AS 11 - 1200

EDITED BY

M. M. ABUBAKAR, T. A. ADEGBOLA AND I. S. R.
BUTSWAT

MRS. K. E. AKANDE

Published 2001

Typeset in Nigeria by
Ramadan Press Ltd., Bauchi

The contents of these Proceedings of the 34th Annual Conference of the Agricultural Society of Nigeria (ASN) have been reviewed and edited in the same manner as the Journal articles.

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form and by any means electronic, mechanical photocopying, recording or otherwise, without the prior permission of the ASN

AGRICULTURAL SOCIETY OF NIGERIA

NATIONAL EXECUTIVE COUNCIL MEMBERS

President	Dr. M. C. Igbokwe (NRCRI, Umudike)
1 st Vice-President	Dr. N. N. Igwilo (IAR & D. UNIPOINT)
2 nd Vice-President	Dr. E. D. Imolehin (NCRI Badeggi)
Secretary General	Dr. O. J. Ariyo (UNAAB, Abeokuta)
1 st Asst. Secretary (Newsletter Editor)	Dr. D. I. Okereke (FCA, Ishiagu)
2 nd Asst. Secretary	Dr. A. I. Okeke (MOUA, Umudike)
Treasurer	Dr. J. C. Okonkwo (NRCRI, Kuru, Jos)
Asst. Treasurer	Dr. J. Omueti (AAU, Ekpoma)
Editor-in-Chief	Prof. S. U. Remisson (AAU, Ekpoma)
Business Manager	Mr. G. N. Asumugha (NRCRI, Umudike)
Council Member	Dr. C. C. Chinaka (NAERLS, ABU, Zaria)
Council Member	Dr. T. Mafolasite (OORBDA, Abeokuta)
Immediate Past President	Tunji Akinniyi (OORBDA, Abeokuta)

LOCAL ORGANIZING COMMITTEE MEMBERS

LOC Chairman	Prof. T. A. Adegbola
Chairman, Technical Sub-committee	Prof. M. M. Abubakar
Chairman, Finance Sub-committee	Dr. V. A. Tenebe
Chairman, Protocol Sub-committee	Dr. S. Bogoro
Chairman, Welfare Sub-committee	Dr. G. N. Udom
Member	Prof. T. O. Oseni
Member	Dr. S. T. Mbap
Member	Dr. S. Kushwaha
Member	Dr. B. M. Auwalu
Member	Dr. Y. Shehu
Member	Alhaji Koshe Mohammed
Member	Alhaji Liman Bello
Member	Mal. Iiyasu Ibrahim
Member	Alh. S. A. Usman
LOC Secretary	Dr. I. S. R. Butswat

TABLE OF CONTENTS

Table of Contents	iii
Preface	v
Presidential Address- DR. M. C. Igbokwe	1
Consistency in Agricultural Policy and Its Implementation – Keynote Address By Ambassador (Dr) Hassan Adamu, Honourable Minister of Agriculture and Rural Development	5
Integrated Rural Development and Poverty Alleviation Honourable S. L. Wazhi, Commissioner of Agriculture and Natural Resources, Plateau State	11
The Role of Women in Agriculture and Poverty Alleviation - Dr. Aisha U. Mahmood, Honourable Commissioner, Bauchi State Ministry of Women Affairs and Social Development	15
Integrated Biosystem (IBS) Technology Towards Sustainable Agriculture – Dr. M. O. Agho, Director FEPA/ZERI, ATBU, Bauchi.	17
The Role of Women in Agriculture: A Case Study of Mangu Local Government Area of Plateau State - Dikwal, M. M. and Jirgi, A. J.	26
Agricultural Productivity and Poverty Alleviation Issues: The Nigerian Perspective Umeh, J. C., Lawal, W. L. and Oboh, V.U.	32
Economics of Crop Production in Traditional Farming in Northern Nigeria: A Case Study of Dundaye Village in Sokoto State - Jirgi, A. J. and Baba, K. M.	41
Economic Benefits of Soybean Research Investment in Nigeria -Tiamiyu, S.A., Uwala, A.C., Ayoola, G.B., Oyekan, P.O., Ojehomon, V.E.T., Wayagari, W.J., Idowu, A.A. and Misari, S.M.	48
Effects of Socio-Economic Factors on Consumption of Milk and Milk Products in Bauchi Metropolis -Muhammad, B. F., Abubakar, M.M. and Kibiya, B. I.	53
Urban Agriculture as a Strategy For Sustainable Food Security and Poverty Alleviation in Nigeria - Ekwe, K. C.	59
Testing Ginger Market Integration in Nigeria-Asumugha, G. N. Njoku, J.E. and Nweke, F. I.	66
Economics of Small Scale Yam Production in Qua'an Pan Local Government Area of Plateau State- Kushwaha, S and Polycarp, I. M.	69
Procurement and Utilization of Institutional Credit by Small Scale Farmers in Katagum Local Government Area of Bauchi State-Rabo, E. K; Kushwaha, S and Abubakar, M. M.	75
Comparative Economic Analysis of Animal Traction Technology in Jigawa State; Empirical Evidence Under Crop Production -Haruna, U and Umar, M.B.	81
Prevalence of Dermatophilosis in Cattle in Bauchi State, Nigeria.- Mai, H. M. and Saidu, I.	85
Effects of Type and Level of Coagulants on the Organoleptic Properties of Soft-Cheese- Muhammad, B. F., Abubakar, M.M. and Shuaibu, H.D.	92
Estimate of Genetic, Phenotypic and Enviromental Correlations in a Mixed Herd of White Fulani and Holstéin- Friesian Cattle and Their Grades at Vom- Mancha, Y. P. and Nwakalor, L. N.	98

Characteristics of Small Holder Sheep and Goat Management Practices in Southern Bauchi State -Abubakar, M., Kalla, D. J. U.; Ngele, M. B. and Haliru, J. A.	=	=	=	104
Effect of Varying Regiments of Early Nutrient Restriction on the Economics of Broiler Production -Fabiya, K. E, Atteh, J. O., Bivan, G. M. and Kutus A.P	=	=	=	111
Haemagglutinins and Trypsin Inhibitors in Some Tropical Legume Seeds: Their Significance in Animal Nutrition : A Review- Fabiya, K.E., Abubakar, M. M., Oyawoye, E.O. and Adegbola, T.A.	=	=	=	116
Effect of Diets Containing Varying Levels of Millet Offal on the Growth Performance of Nile Tilapia (<i>Oreochromis niloticus</i> Linnaeus)-Abdulkarim, M. and Ipinjolu, J.K	=	=	=	121
Characterization of Local Chickens in Yobe State, Nigeria -Mbap, S.T. and Zakar, H.	=	=	=	126
Effects of Size (Number of Nodes) of Planting Material on Performance of Sweet Potato Varieties- Nwokocha, H. N.	=	=	=	132
Basic Operations and Maintenance of Animal Traction Farm Tools and Implements- Ahmed, H. I.	=	=	=	138
Relationship of Oil Yield Components with their Respective Coefficient of Variation Within and Among Different Crosses of the Oil Palm (<i>Elaes guinnensis</i>) - Russom, Z.	=	=	=	147
Reaction of Sunflower Cultivars to <i>Alternaria</i> Blight and Yields of Sunflower at Samaru, Zaria-Tanga'n, B. N. and Akpa, A.D	=	=	=	152
Preliminary Investigation into the Diseases Affecting Irish Potato in a Northern Guinea Savanna Location of Nigeria -Adebitan, S.A. , Udom, G.N. and Gurama, A.U.	=	=	=	157
The Effect of Legumes and Farm Yard Manure, on the Growth and Yield of Sugarcane (<i>Saccharum officinarum</i> L.-Gana, A. K. and Busari, L. D	=	=	=	162
Effect of Plant Spacing on the Growth and Yield of Cowpea <i>Vigna unguiculata</i> (L) (Walp) in Yola, Nigeria -Sajo, A.A., Okusanya, B.A., Jada., M. Y. and Bello, D.	=	=	=	166
Effect of Three NPK Levels on the Yield of Rosselle (<i>Hibiscus sabdariffa</i> L.) in Yola, Nigeria-Okusanya, B. A., Arifalo, E.I. and Atem, A. M.	=	=	=	169
Performance of Early and Medium Maturing Soybean (<i>Glycine max</i> (L.) Merrill.) Varieties at Bauchi -Tenebe, V. A. Auwalu, B. M. and Ogbadu, H.O.	=	=	=	175
Pre-Treatment Effects on The Germination and Early Growth of <i>Albizia lebbek</i> and its Suitability as Livestock Feed- Kareem, I.A., Adedeji, T.A. and Yakubu, I.M.	=	=	=	180
The Influence of Agrolyser Micro-Nutrients on the Growth and Grain Yield of Maize in Mayo-Belwa Area of Adamawa State -Gungula, D. T., Sajo, A. and Uhure, V.	=	=	=	187
Agricultural Land Use in Ikwuano LGA, Abia State: Implications for Agro-Technology Transfer-Chukwu, G. O. and Chinaka, C.C.	=	=	=	192
Development of The Minituber Technique for Seed Yam Production - Ikeorgu, J. E. G,	=	=	=	196
Evaluation of the Insecticidal Activity of <i>Hyptis spicegera</i> on <i>Callosobruchus maculatus</i> in Stored Cowpea -Adamu, H. M. and Ali, A.	=	=	=	201
Effects of Green Manuring on the Profitability of Sugarcane Production in the Southern Guinea Savannah of Nigeria-Tiamiyu, S.A., Busari, L.D. and Gana, A. K.	=	=	=	205

HAEMAGGLUTININS AND TRYPSIN INHIBITORS IN SOME TROPICAL LEGUME SEEDS: THEIR SIGNIFICANCE IN ANIMAL NUTRITION - A REVIEW.

FABIYI, K.E, ABUBAKAR, M.M., OYAWOYE, E.O. and ADEGBOLA, T.A.
Animal Production Programme, Abubakar Tafawa Balewa University, Bauchi.

ABSTRACT

Legumes are important source of protein and energy in the diet of farm animals. The use of legumes for livestock nutrition is however, impeded by the presence of antinutritional substance in their seeds. The most important ones include haemagglutinins and trypsin inhibitors. Haemagglutinins adversely affect the absorption of nutrients from the intestinal tract, agglutinates the erythrocytes, induces severe reduction in feed intake and depresses growth. Trypsin inhibitors negatively affect proteolytic activity of the digestive enzyme trypsin which can lead to reduction in the availability of amino acids, induced pancreatic hypertrophy and depressed growth. Inactivation of these undesirable substances in legume seeds is essential in order to improve their nutritional quality in livestock feeds. This paper high-lights the contents, nutritional significance and effects of processing (roasting, cooking and autoclaving) on haemagglutinins and trypsin inhibitors in some tropical legume seeds such as African yam bean (*Sphenostylis stenocarpa*), bambaranut (*Voandzeia subterranea*), kidney bean (*Phaseolus vulgaris L.*), Lima bean (*Phaseolus linatus L.*), pigeon peas (*Cajanus cajan L. Millsp.*), and jack bean (*Canavalia ensiformis*). The application of moist heat has been found to be the most efficient method of inactivating haemagglutinins and trypsin inhibitors in these legume seeds.

INTRODUCTION

Legumes are vital sources of protein and energy in diet of farm animals. The deleterious effect of ingested raw legumes have been attributed to the presence of antinutritional factors in their seeds. Antinutritional factors are substances in the seed that reduce the nutritional value of feedstuff and affect the animal adversely. Several antinutritional factors abound in plant seeds, among the most important ones are haemagglutinins and trypsin inhibitors. When considering antinutritional or toxic factors in seeds which may serve as potential feedstuff for livestock, it is worth noting that it is only the toxicity associated with oral ingestion of the factor that has any nutrition significance. This is because a factor which may be toxic if injected into the body may not be toxic if orally ingested due to possible modification by gastro-intestinal tract (Carlini and Udedibie, 1997). The inclusion of raw legumes in the diet of livestock animals lead to a significant impariment in growth and other undesirable physiological and biochemical alterations. Inactivating or removing of undesirable components is essential in order to improve the nutritional quality of legumes and effectively utilize their full potential as livestock feed. It is widely accepted that simple and inexpensive processing techniques are effective methods of achieving desirable changes in the composition of legume seeds.

This paper highlights the nutritional significance and the effects of processing (roasting, cooking and autoclaving) on haemagglutinins and trypsin inhibitors in some tropical legume seeds such as African yam bean, bambaranut, kidney bean, lima bean, pigeon pea and jackbean.

Haemagglutinins

Haemagglutinins also called lectins are Carbohydrate-binding proteins that are resistant to digestion (Pusztai, 1989). These proteins possess a specific affinity for certain sugar molecules present in the membranes of many animal cells, including those of the intestinal mucosa. Haemagglutinins are capable of agglutinating the erythrocytes of many animal species and can also react with the sugar components of intestinal cells causing a disruption in cell structure which leads to abnormalities in nutrient absorption. (Jayne Williams, 1973; Jaffe, 1980) postulated that lectin induced disruption of the intestinal cell structure permits invasion of lymph, blood and liver by bacteria normally confined within the lumen of the gut. Consequently the animal succumbs to the otherwise innocuous organisms.

Haemagglutinins adversely affects nutrient absorption and utilization by various mechanisms. It binds to the glycoprotein and glycolipids of the digestive tract mucosa (Hague, 1975; Jaffe, 1980), inhibits the activity of the enzymes of brush border of the enterocytes (Rosenthal, 1972) and likely has several negative effects on protein and carbohydrate metabolism, hormonal function, enzyme activities and immune functions (Pusztai, 1989). It induces severe reduction in feed intake of monogastrics and thus leading to growth depression (Larue -Achagiotis *et al.*, 1992) (Table 1).

Table 1: Nutritional Significance Of Haemagglutinins And Trypsin Inhibitor

Antinutritional factor	Implications	References
1. Haemagglutinins	(a) Agglutinates the erythrocytes. (b) Induces severe reduction feed intake. (c) Adversely effects nutrient absorption and utilization in various ways. (1) Causes disruption of the cell structure of intestinal mucosa. (2) Permits invasion of lymph, blood and liver by bacteria. (3) Inhibits the activity of the enzymes of enterocytes. (d) Negatively affects protein and carbohydrate metabolism.	Liener, 1979 Leon <i>et al.</i> , 1991. Hague, 1975; Jaffe, 1980. Jayne-Williams, 1973. Rosenthal, 1972.
2. Trypsin inhibitors	(a) Inhibit the proteolytic activity of the digestive enzyme trypsin. (b) Lead to reduced availability of amino acids. (c) Induce pancreatic hyper-trophy. (d) Cause growth depression.	Pusztai, 1989 Larue-Achagiotis <i>et al.</i> , 1992 Liener, 1976 Liener and Kakade, 1980 Roebuck, 1986 Liener and Kakade, 1980

Trypsin Inhibitors

Trypsin inhibitors have been implicated in reducing protein digestibility and in pancreatic hypertrophy (Liener, 1976).

They are polypeptides that form well-characterized stable complexes with trypsin on a one-to-one molar ratio, obstructing the binding sites and disrupting the enzymatic action (Carlini and Udedibie, 1997). Trypsin inhibitors inhibit the proteolytic activity of the digestive enzyme trypsin which can lead to reduction in the availability of amino acids (Liener, 1976; Liener and Kakade, 1980). Trypsin inhibitors induce pancreatic hypertrophy (Roebuck, 1986) and depress growth (Table 1).

Heat Treatments

Heat processing is widely accepted as an effective means of inactivating the thermolabile antinutritional factors of legume grains. The nutritive quality of most tropical legume grains, particularly cowpea, soybean, pigeon pea, lima bean and winged beans is notably improved by heat treatment. Heat treatment improves protein quality by inactivating antinutritional factors, particularly trypsin inhibitor and haemagglutinin and by unfolding the protein structure, thus making them more susceptible to attack by digestive enzymes (Sathe *et al.* 1984).

Complete inactivation of haemagglutinins in the raw tropical legume seeds were achieved by cooking and autoclaving (moist heat treatment), while roasting (dry heat treatment) was less effective in the elimination of the haemagglutinating activity of the raw seeds, with the exception of bambaranut (Apata and Ologhobo 1997). It was also observed that cooking was the most effective method in inactivating the trypsin inhibitors present in the raw legume seeds followed by autoclaving which was also more effective than roasting (Apata and Ologhobo) (Table 3). Carlini and Udedibie (1997) reported that it took 2 hours of boiling to completely eliminate trypsin inhibitor activity in jackbean and 3 hours of boiling to completely inactivate haemagglutinins in the legume.

Moist heating is often more effective than dry heating, and the degree of inactivation is also governed by temperature, duration of heating and particle size (D' Mello, 1982). Other authors (Babar *et al.*, 1988; Bressani and Sosa, 1990; Carlini and Udedibie, 1997) have also reported the superiority of moist heat over dry heat as methods for processing the jackbean seeds.

Table 2: Haemagglutinating activity in raw and processed tropical legumes (HU/mg Protein)

Legume type	Raw Seeds	Cooked seed	Autoclave d Seeds	Roasted seeds
African yam bean	38	0	0	3.7
Bambaranut	5	0	0	0
Kidney bean	102	0	0	12.3
Lima bean	59	0	0	5.3
Pigeon pea	18	0	0	0.9
Jack bean	73	0	0	9.5

HU = Haemagglutinating Unit

Source: (Apata and Ologhobo, 1997)

Table 3: Trypsin inhibitor activity in raw and processed tropical legumes (TIU/mg Protein)*

Legume type	Raw seeds	Cooked seeds	Autoclaved Seeds	Roasted seeds
African yam bean	43.1	0	3.0	13.2
Bambaranut	9.4	0	0.4	2.7
Kidney bean	87.6	0	10.4	27.4
Lima bean	88.6	0	7.4	29.3
Pigeon pea	23.8	0	1.2	6.2
Jack bean	41.6	0	5.2	14.7

* Trypsin inhibitor units (TIU) per mg protein.

Source: Apata and Ologhobo, 1997.

CONCLUSION

The application of moist heat (particularly cooking) has been found to be the most efficient method of inactivating haemagglutinins and trypsin inhibitors in legume seeds. The fact that some sources of plant protein are capable of producing harmful effects in animals is in itself of importance with respect to man's food supply. Thus the role of naturally occurring antinutritional substances as they relate to their effects on animals cannot be dismissed as being irrelevant to the problem of feeding.

REFERENCES

- Apata, D.F and Ologhobo A.D (1997). Trypsin inhibitor and other antinutritional factors in tropical legume seeds. *Tropical Science*. 37: 52-59.
- Babar, V.S., Chava J.K and Kadam, S.S. (1988) Effects of heat treatments and germination on trypsin inhibitor activity and polyphenols in jackbean (*Canavalia ensiformis*) *Plant Food for Human Nutrition*. 38: 319-324.
- Bressani, R. And Sosa, J.L (1990). Effects of processing on the nutritive value Of *Canavalia* jackbean (*Canavalia ensiformis*). *Plant Food for Human Nutrition*.40: 207-214.
- Carlini, C.R. and Udebibie, A.B.I (1997). Comparative effects of processing methods on haemagglutinating and antitryptic activities of *Canavalia ensiformis* and *Canavalia braziliensis* seeds. *Journal of Agricultural and Food Chemistry*.45(11): 4372-4377.
- D'Mello, J.P.F. (1982). Toxic factors in some tropical legumes. *World Review of Animal Production*. 18:41-46.
- Hague, D. (1975). Studies of storage proteins of higher plants. 1. Concanavalin A from three species of the genus *Canavalia*. *Plant Physiology*, 55:636-642.

- Jaffe, W.G. (1980). Haemagglutinins (lectins). **In: Toxic Constituents of Plant Foodstuffs.** (Ed. Liener I.E.) New York; Academic Press, pp 525-552.
- Jayne-Williams, D.J. (1973). The influence of dietary jackbean (*Canavalia ensiformis*) and concanavalin A on the growth of conventional and gnotobiotic Japanese quail (*Coturnix coturnix japonica*), *Nature New Biology*, **243**:150-151.
- Larue-Achagiotis, C., Pichard, M. and Louis-Sylvestre, J. (1992). Feeding behaviour in rats on a complete diet containing concanavalin A. *Reproduction and Nutrition Development*, **32**:343-350.
- Leon, A.M., Caffin J.P., Plassart, M. And Picard, M.L (1991). Effect of concanavalin A from jack bean seeds on short -term food intake regulation in chicks and laying hens. *Animal Feed Science Technology*, **32**: 297-311.
- Liener, I.E. (1976). Legume toxins in relation to protein digestibility - a review. *Journal of Food Science*, **41**:1076-1081.
- Liener, I.E. (1979). Phytoheamagglutinins. **In: Herbivores: Their Interaction with Secondary Plant Metabolites** (Ed. Rosenthal, G.A.). Academic Press, New York, pp 567-597.
- Liener, I.E. and Kakade, M.I (1980). Protease inhibitors. **In: Toxic Constituents of Plant Foodstuffs** (Ed. Liener, I.E.) New York; Academic Press pp. 7-71.
- Pusztai, A. (1989). Biological effects of dietary lectins: **In: Recent Advances of Research in Antinutritional Factors in Legume Seeds;** (Ed. Huismay) Wageningen., The Netherlands, pp 17-29.
- Roebuck, B.D. (1986). Enhancement of pancreatic carcinogenesis of raw soy protein isolate. **In: Nutritional and Toxicological Significance of Enzyme inhibitors in Foods**, pp. 91 (Ed. Friedman, M.). New York, Plenum Press.
- Rosenthal, G.A. (1972). Investigations of canavanine biochemistry in the jackbean plant. II Canavanine biochemistry in the developing plant. *Plant Physiology*, **50**: 328-331.
- Sathe, S.K., Deshpande, S.S. and Salunkhe, D.K. (1984). Dry beans of *Phaseolus*: a review: part 1. Chemical composition: Proteins CRC *Critical Review of Food Science and Nutrition* **20**: 1 - 46.