

SUMMARY OF DISCUSSIONS ARISING FROM PAPERS

AFRIPRO: DAY 1 (2 April 2003)

Overall Objectives of Workshop (PS Belton)

Clear view of needs and opportunities in research towards improvement of quality of sorghum and millets to the benefit of Africa

- Where we need further research?
- Exploitation of crops?
- Who will be the beneficiaries?
- Improvement of quality (agriculture and food)

Overview: Importance of Sorghum in Africa (JRN Taylor)

DISCUSSION

1. Regional seed movement (and seed production) should be encouraged (Uganda example)
2. Why is maize not used in brewing? Difficulty in using mash filter? Maize also has a higher fat content than sorghum and can become rancid.
3. Straight run sorghum, hammer milled is a cheap raw material and the end product is similar to that of lager beer.
4. Why use roller milling instead of hammer mill for certain products? Roller milling provides for a better quality flour – more control with roller mill than hammer mill; one can adjust flukes on roll and settings, control quality of product better; therefore better adapted for producing certain processed products

Overview: Importance of Millets in Africa (AB Obilana)

DISCUSSION

1. Are there already mixed composite packaged products on the market and are there instructions for preparation? No, but the potential market is there. At present, millet composite flour is bought directly from the markets where they are mixed on demand. There is a need to improve the packaging (potential for mixing it with cassava since this is quite popular). Composite flours for thin porridges are sold in packaged form.
2. Is it possible to develop the uji market (small market at present time)? Is it possible for uji to compete with maize meal in the market or is it too expensive? Not really competition for maize meal since uji/sorghum mix is preferred to maize porridge. Suggestion to make it less expensive and more available. In the case of ugali (large scale) there is still a problem with grain supply and access.

The Prolamin Storage Proteins of Sorghum and Millets (PR Shewry)

DISCUSSION

1. There seems to be similarities between kafirins and zeins? What is it that makes the difference in solubility? Is it minor amino acids? Yes, possibly. We do not know how the proteins interact; 3 D structure is difficult to determine but the structure can be inferred from spectroscopy and models.
2. Is sorghum low in methionine? Are the differences in kafirin sequence or protein amount? Variable info from literature. This is based on the available data from the literature. A decent analysis of sorghum kafirin structure is required to answer this question.
3. Is anything known about variety differences – Not known (sequences reported in literature is useful as long as you believe them!)
4. Is tef high in lysine? We do not know. It could be related to the amounts or sequences of the storage proteins. Currently, we do not have full sequences for tef.

Improvement of the Protein Quality of Sorghum and its Introduction into Staple Food Products for Southern and Eastern Africa (PS Belton)

DISCUSSION

1. We work for the end-users: Do people know about the textbook in West Africa? Make more available elsewhere and get it translated? Who could do this? Prof Obilana? Have a re-look at dissemination of information in the region. For example, in Namibia, the FAO helped disseminate information to the pearl millet industry (guide to process fermented pearl millet flour) Important to transfer technology in these research projects but there are problems relating to financing the industry partners to commercialise potential products. We should learn from successful experiences elsewhere, e.g. in Vietnam there are cheap, extruders available to produce weaning foods. It should be possible to adopt this technology in the African context as well.
2. Can one use case studies to assist researchers to with technology transfer—from research to production? Reality is that industry will not easily put in money and what about the IP issue? – How to turn ideas into products?
Some suggestions were:
 - a. Options in EC to get pilot projects funded or demo projects funded: we are encouraged to draw the attention of the EC to exploit this type of funding
 - b. Global collaboration is encouraged. Remember that what we do here is not necessarily only an African problem. We need to combine different regions and coordinate actions e.g. to submit joint proposals to EU
3. Is there a web-site output of this project's results? Further work is required here.

Environment-friendly Packaging Solutions for Enhanced Storage and Quality of Southern Africa's Fruit and Nut Exports (M Stading)

DISCUSSION

1. Can you bleach the red sorghum so that you have a clear film? If you want a clear film, it makes more sense to rather use a white sorghum. Red sorghum might be useful e.g. for lychis (antioxidant properties of red sorghum's polyphenol is a big plus)
2. Are there any cheaper sources than sorghum for extracting kafirin and what about the utilization of by-products or waste for animal feed? In Botswana where a white sorghum meal is produced from a red sorghum variety, mountains of sorghum bran surround the mill. This is clearly a waste product where considerable value could be added. We were reminded about the fact that the prolamins are concentrated in the endosperm, but current milling practices actually allows for some endosperm in the bran fraction.
3. Can one actually produce decent films from spent grain? Yes, but some variability could be possible depending on the processes involved.
4. How feasible and valuable is this current project? Landfills are a big problem in the world. We still need environmentally friendly packaging material. This could also create a future demand for sorghum production if the possibility of high value commodities produced from it, is available.

Genetic Enhancement of Nutritional Quality of Grain Sorghum (MM O'Kennedy)

RESEARCH NEEDS/DISCUSSION

1. Eliminate the potential risk for GM plants – use marker genes.
2. Consumer perceptions might be a problem – use clean fragments
3. In South Africa, is the government in favour of GMO, since there is sometimes tremendous opposition? We are allowed to have greenhouse and field trials – our government is positive.
4. Apart from increased nutritional quality, can this project also increase the yield? We work hand in hand with breeders. They try to improve the yield and we work on characteristics that they want us to deal with.
5. Groups currently working on beta amylase in sorghum and pearl millet: incorporating barley beta amylase? No.
6. What about the problem of overproduction of polyphenolics during transformation? One should more regularly transfer to fresh media

Collaborative Project to Investigate Consumer Preferences for Selected Sorghum and Millet Products in the SADCC Region of Africa (HS Laswai)

DISCUSSION

1. A palatability question: Are improved varieties assessed by consumers or only by breeders? Both but consumers do seem to have different preferences.
2. Is it possible to use existing maize milling facilities to process sorghum (dehulling)? Apparently not, reasons not quite clear.

3. Issue of marketing is a big one. It should be extended to the region. Where to sell a problem; storage a problem.
4. What about rejected varieties? A suggestion was made to come up with authentic processes for alternative uses/products. Remember, that people eat food and not agricultural produce – everything should be driven by consumer needs and demands.
5. Birds a problem – greatly underestimated!
6. Finger millet info intriguing – storage not a problem, good price on market etc., nutrition is good, everybody produces it as a cash crop. Is it perhaps the neglected crop? Do we consider finger millet as the forgotten crop – the unknown survival crop! We do not know a lot about finger millet – whom do they sell it to? What are the possibilities? This needs further discussion.

Overview: Sorghum Proteins and Food Quality (BR Hamaker)

DISCUSSION

1. When extruded, protein bodies are distorted. Work has been done with manufacturers on corn flakes. Cohesive flakes are formed because proteins are playing structural role in the flakes (flattens and pulls out proteins)
2. Do plant enzymes work better than added enzymes? Yes, they seem to work better – it really is a matter of time (erosion from outside)

Overview: Sorghum and Millet Food Research Failures and Successes (L W Rooney)

DISCUSSION

1. Comment: Should we really regard the reduced protein digestibility of cooked sorghum as a problem – farmers prefer sorghum and not maize – “fills the stomach”
2. What grading standards are used in the US for white sorghum? There is a white sorghum class in the US but this is not available on the commodity market – it is identity preserved through contracts with the farmers. A class called, sorghum, is available on the commodity market. The sorghum class is a mixture of red and white varieties.

AFRIPRO DAY 2 (3 April 2003)

Effect of Grain Organisational Structure, Wet and Dry Cooking on Sorghum in vitro Protein Digestibility (K G Duodu)

RESEARCH NEEDS/DISCUSSION

- Mechanism for protein-cell wall adhesion
- Role of phenolics (mainly flavonoids) on protein digestibility not known
- More detailed studies on protein bodies required
- Nature of reduction-resistant oligomers to be elucidated

- Varietal variation
- Heterologous expression of kafirins to facilitate characterization
- Effects of zeins and coixins on digestibility when expressed in sorghum
- Electron microscopy and atomic force microscopy to study protein bodies
- Cross change in secondary structure known, but changes not known for respective kafirins

Antinutrients or Antioxidants in cereal grains: An Evaluation of the Composition and Functionality of Phenolic Compounds with Special Reference to Sorghum and Barley (T Beta)

RESEARCH NEEDS/DISCUSSION

Soft textures are preferred for malting but may result in greater mould growth
 No ideal sorghum – it can be white or tannin free for some applications, depending on consumers, millers and maltsters.
 Need to utilize farmers’ knowledge for breeding appropriate lines

Consumer attitudes to sorghum foods in Botswana (MM Kebakile)

RESEARCH NEEDS/DISCUSSION

Production of convenient sorghum foods are required
 Important to enrich or fortify soft porridges, since the protein content is very low (1.1%) and requirements for immuno-compromised individuals for protein is twice the normal RDA for protein; vitamin A is also important for these individuals and this nutrient is lacking in sorghum. Fortification with locally available legumes.
 Choice for sorghum products are based on nutrition or health benefits (young people), price (affordable) and traditional flavour (older people)
 Quality parameters important when consumers buy sorghum products include: light colour and medium particle size

Prospects for Improving Sorghum Grain Quality (MM O ‘Kennedy and PR Shewry)

DISCUSSION

Consumer acceptability issues
 Consumer driven research, people eat food not agriculture produce

Sorghum and Millet Breeding in West Africa (IDK Atokple) and Southern Africa (M Chisi)

RESEARCH NEEDS/DISCUSSION

- ❖ Improving the nutritional quality
 - increasing lysine content
- ❖ Functional quality of grain
 - For processing, storage & sensory quality requirements

- ❖ Mould resistance and post harvest losses
- ❖ Explore the genetic resources existing in the Sudanese and Ethiopian sorghums and millets varieties for lysine content

Large Scale Extraction of Cereal Biopolymers (C Erasmus)

RESEARCH NEEDS/DISCUSSION

- ❖ The heat sensitivity of kafirin: its implications in film production and quality
- ❖ Selection of raw materials and their effects on kafirin yield and quality
- ❖ The technical and economic feasibility of:
 - Enzyme application kafirin extraction
 - The combined ethanol and kafirin production.

Cereal Biopolymer Films, Coatings and other Industrial Products (MN Emmambux, S Iannace and M Stading)

RESEARCH NEEDS/DISCUSSION

- ❖ Need to explore other high value application of bio-films in addition to the bulk applications
- ❖ Improvement of the strength and barrier properties of the bio-films
- ❖ Any medical or pharmaceutical applications – an interesting future application?

Influence of Malting on Sorghum Protein Quality (J Dewar)

DISCUSSION

Alkali is toxic at higher concentrations and decreases malt quality
Malt quality must be balanced against malting losses

Bread-making with Malted and Fermented Sorghum (LF Hugo)

DISCUSSION

Sourdough type process increases bread volume and softness without changing the baking process - Pilot baking trials are going to take place
Suggest steaming instead of boiling the malt to inactivate the amylases, may also decrease losses of water-soluble components and increase digestibility
Suggest disruption of protein matrix by shear to improve sorghum bread making quality
Investigate role of starch in providing viscosity

Effect of Addition of Malted and Fermented Sorghum Flours on Extruded Sorghum Weaning Porridges (SM Wambugu)

RESEARCH NEEDS/DISCUSSION

Investigate ratios of malt to flour to fermented flour to optimally lower viscosity

Optimise malting and extrusion conditions

Investigate whether malt of higher Diastatic Power will decrease viscosity further

Investigate effect of extrusion on protein quality

Suggest solar drying to reduce costs

Importance of potable water and possible water purification by solar pasteurization

Need to convince commercial food processors of benefits of processes before commercialization can take place

Food Products from Malted Pearl Millet (LAM Pelembe)

DISCUSSION

Possible uses for pearl millet malt- baking industry, weaning foods, malt in lager beer, mageu

Improving the Commercial Viability of Sorghum and Pearl Millet in Africa (DD Rohrbach)

NEEDS/DISCUSSION

Need for large volume uses to bring in required economies of scale (assembly and transport costs) – 5 000 tonnes, drives consistency of supply and quality of grain

Identify areas of government subsidies – grain strategic stocks, feeding programmes, prisons – replace these with sorghum and millet to some extent

Need to link above with crop management strategies to make sorghum and pearl millet cheaper and more available

Provide potential processors with examples of successes

Poultry industry has great potential as it is growing very fast with economic growth