

STATE OF THE ART OF BIOTECHNOLOGY RESEARCH IN ZAMBIA

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ABSTRACT

Development and utilisation of biotechnology in Zambia is limited because of lack of trained manpower, inadequate research facilities, and high investment costs. Nevertheless, biotechnology is being used in the domestication and utilisation of wild fruits, and development of biofertilizers. There are also biotechnology projects to modernise and improve the nutritional qualities of local foods and beverages. In the animal sector, artificial insemination is being used to improve indigenous cattle, and an embryo transfer project is being supported by Australia. Vaccines are also being developed against haemorrhagic septicaemia, blackleg, anthrax and brucellosis.

Key Words: Artificial insemination, beverages, biotechnology, biofertilizers, embryo transfer, fruits

RÉSUMÉ

Le développement et l'utilisation de la biotechnologie en Zambie sont limités par le manque de personnel qualifié, les infrastructures inadéquates de recherche et les coûts d'investissement élevés. Néanmoins, la biotechnologie est en train d'être utilisée dans la domestication et l'utilisation de fruits sauvages et le développement des biofertilisants. Il y a aussi de projets de biotechnologie en vue de moderniser et d'améliorer les qualités nutritionnelles des aliments et boissons du pays. Dans le secteur animal, on utilise l'insémination artificielle pour améliorer les bovins indigènes, et un projet de transfert d'embryon est en train d'être soutenu par l'Australie. Les vaccins sont développés pour lutter contre la septicémie hémorragique, la maladie de pied noir, l'anthrax et la brucellose.

Mots Clés: Insémination artificielle, boissons, biotechnologie, biofertilisants, transfert d'embryon, fruits

INTRODUCTION

The challenge Zambia has to tackle is how to employ biotechnology in utilising its available resources effectively in order to enhance the provision of both national food security and household food security. This, however, must be done in a socially acceptable and sustainable manner, taking into account Zambia's unique culture, land,

and climate as well as microbial, plant and animal resources. For Zambia to benefit from the promise of biotechnology, the country needs to formulate a biotechnology policy, strengthen appropriate scientific capabilities and institutions, develop necessary productive infrastructure, and institute sound regulatory instruments. In this regard, Zambia is studying biosafety guidelines and regulation being developed, e.g. in Kenya (Wafula,

1995), or already in use in other countries, such as Mexico (Alvarez-Morales, 1995).

CROP IMPROVEMENT

The low crop food production in Zambia is due to a number of factors, prominent among which are adverse environmental conditions such as drought and high soil acidity and salinity, as well as crop susceptibility to pathogens and pests. Drought in particular has contributed significantly to low crop production in the country.

The National Council for Scientific Research (NCSR) has a Tree Improvement Research Centre which has projects on the domestication of wild fruit trees, Masuku (*Uapaca kirkiana*) and Mungongo (*Ricinodendron rautanenii*), in which plant tissue culture techniques are being used.

The Masuku fruit has shown potential in the production of both alcoholic and non-alcoholic beverages. The NCSR is in the process of transferring the technology of producing wine from the Masuku fruit. Also, the NCSR has disseminated information on the preparation of Masuku drink to women's organisations in rural areas. It is evident that the domestication of other wild fruit trees could lead to the diversification of food sources in Zambia.

The Mt. Makulu Central Research Station of the Ministry of Agriculture, Food and Fisheries has concentrated its efforts in increasing agricultural plant production of maize, soybeans, phaseolus beans and groundnuts. In the case of maize, the objective is to increase the yields of small-scale farmers from 1.0-1.5 to 8.0 tonnes per hectare, which commercial farmers are currently producing. Using imported maize germplasm, high yielding maize varieties have been developed which are now being used by both commercial and small-scale farmers. This has been responsible for increased maize production in Zambia. Encouraging and promising results have also been obtained in developing maize varieties which are resistant to the maize streak virus disease and which at the same time are high yielding. The maize streak virus causes one of the major maize diseases in Zambia. Virus resistant maize varieties are undergoing final tests before they are distributed to farmers.

The breeding of sorghum has produced varieties which can be used for brewing and for normal consumption. However, despite the fact that sorghum, millet and cassava were traditionally consumed in Zambia before maize was introduced, a lot of people no longer eat them. Therefore, there is a need to encourage Zambians to go back to the past traditional foods.

Increased legume production has been achieved with the use of nitrogen fixing bacteria. Rhizobium inocula are distributed to commercial farmers who grow soybean and phaseolus beans, peas and groundnuts. In case of soybean, the use of Rhizobium inoculum has increased production from 1277 to 3144 kg ha⁻¹.

The Mt. Makulu Central Research Station is currently directing its research efforts to the needs of small-scale farmers who have no access to Rhizobium inocula. This work mainly involves isolating indigenous legumes which are natural nodule formers. This would eliminate the need to use the inoculum. Future plans include work on non-symbiotic nitrogen fixation in the growing of rice using Azolla.

LIVESTOCK IMPROVEMENT

The Department of Veterinary and Tsetse Control has concentrated its efforts in the area of livestock improvement, in improving indigenous cattle breeds for small-scale farmers. The use of artificial insemination is now widespread in Zambia and is responsible for the country's success in livestock improvement. The semen used is either imported or obtained from local commercial farmers.

Commercial farmers in Zambia are aware of embryo transfer technology, but they are not keen to use it because it is expensive. Despite this, the department has embarked on an embryo transfer pilot project involving Boran embryos. As part of the project 264 embryos have been exported to Australia where they were implanted in Australian cows. Results of this exercise are being awaited and if successful, a way will be opened for exporting Boran embryos.

The Department of Veterinary and Tsetse Control Services has a research centre which is actively engaged in the development of vaccines. So far vaccines against Haemorrhagic

septicaemia, Blackleg, Anthrax and Brucellosis are being produced by the centre.

The NCSR has a research project on the use of natural plant extracts in the control of tick borne diseases. The research is based on information obtained from traditional herdsmen. The results so far indicate that some of these plant extracts have a potential in the control of some tick-borne diseases.

IMPROVING THE NUTRITIONAL QUALITY OF FOOD

The NCSR has a project on the application of biotechnology to modernise some Zambian traditional foods and beverages, and to improve on their nutritional quality and standardise their preparation. Isolating the concerned microorganisms and studying their potential commercial application is a major component of the project.

Three yeasts have been isolated from traditional alcoholic beverages and their possible use in the brewing and baking industry is being studied. A local beverage called Munkoyo is being developed for commercial production. This beverage is based on mixed fermentation of a meal porridge previously hydrolysed with Monkoyo (*Rhynchosia* species) roots which are a source of amylases.

CONCLUSION

It is evident that biotechnology is absolutely essential to Zambia's progress in food production. Hence, Zambia cannot afford to lag behind in the use of this technology. However, application of biotechnology alone cannot solve the Zambian food crisis since increasing food production is a multi-faced undertaking. It requires a harmonious effort of policy makers, scientists and farmers, among others.

For Zambia to benefit from biotechnology, deliberate steps must be taken to overcome three major constraints: lack of trained scientists and technicians, lack of adequate research facilities, and high investment costs. Regional collaboration in biotechnology research could minimise these constraints.

REFERENCE

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