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Evaluation of some botanicals as an alternative to chemical fungicide in the rapid multiplication of cassava

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Abstract

The use of plant extracts (botanicals) such as standard neem, pepper fruit, *uziza* and ash as local substitutes or alternatives to chemical fungicides (Tecto-60E) in the rapid multiplication of cassava was studied for two years (2004 and 2005) in Nigeria. Percentage sprouting, sprouting vigour and percentage fungus soot were dependent on the treatments and were optimized in 2–node cassava stakes treated with standard neem extract. Standard neem extract and Tecto 60 (chemical fungicide) had similar, significant (p = 0.05) control over fungus soot. The significant growth differences among the treatments with the optimum at standard neem extract indicate the need to adopt neem extract as the best local plant extract as a substitute for or alternative to chemical fungicides using 2–node cassava technique in the rapid multiplication of cassava planting material.

Keyword: cassava, neem, botanicals, fungicides,Tecto–60

Introduction

A major constraint to increased cassava production in Nigeria is an insufficiency of improved planting materials. However, the use of 2–node stakes for rapid multiplication of cassava stakes (IITA, 1990, Eke-Okoro et al 2005) has reduced this problem considerably. Farmers now multiply their planting materials with this technique, using materials such as transparent polyethylene-bags and chemical fungicides. The fungicides are used to prevent fungus attack on the cut surfaces of 2–node stakes. Some of the chemical fungicides usually applied are Tecto 60 (Thiabendazole), Benlate –T (Benomyl + Thiram), Apron plus (Metalaxyl + Carboxin + Furathiocarb), Mancozeb (Dithane M45), (Nnodu and Okwuowulu 1990; Eke-Okoro et al 2005).

Fungus infection is a serious problem in pre-germination or pre-sprouting nursery operations. In most farms, fungus soot reduces sprout energy, vigour, growth and in severe cases damage or delay the emergence of new buds (Wheeler 1978). The control of fungus infection in most cases has been primarily through the use of chemical fungicides. However, some plant extracts (botanicals), e.g., neem, have been found to be effective fungicides. The neem extract has been reported to have insecticidal, fungicidal, and nematicidal properties which are useful in controlling the pests, diseases, and micro-organisms that spoil agricultural produce (Chelfant et al 1990; Prakash and Rao 1997, Jansson and Raman 1991; Hawang 1994). Neem leaves extract has been found to be effective against nursery ants, termites, and garden pests (Stoll 1998, IITA 1999). Nwuzor et al (2005) controlled *Cylas puncticollis* in sweetpotato by applying neem leaves powder in Nigeria. Ginger, cashew, dry chilli pepper, onion scale leaves, and neem seed kernel have been used as surface protectants in the control of cowpea beetle in storage (Ofuya 1986; Sowummi and Akinwusi 1983). Stoll (1998) and Offor (2004) reported that pepper fruit and neem have properties that inhibit the growth of micro–organisms. The non-toxic nature some of plant extracts (neem) to most parasitoids and predators of rice pests have also been reported (Thiam and Dujommun 1993).

At the rural farm level in Nigeria, the use of chemical disinfectants (fungicides) in the pre-sprouting of stems has been difficult to adopt in the rapid multiplication of cassava. This is because the chemical fungicides or disinfectants are scarce, costly when available, and unfriendly to man and the environment. These reasons render the adoption of the rapid multiplication technique by farmers very slow. In most cases, farmers reluctantly use this technique in multiplying cassava stems. To overcome this problem, this study explored the use of locally available, less expensive, and safe plant extracts, such as neem (*Azadirachta indica*) leaves, pepper fruit (*Dennettia tripetala*),

and wood ash as sprout protectants or fungicides against fungus attack on the cut surfaces of cassava stakes as alternatives to chemical fungicides.

Materials and Methods

Three standard plant extracts: standard neem, pepper fruit and *Uziza* seed were evaluated against three controls: ordinary ash, fresh water, and Tecto 60 (chemical fungicide) using 2-node cassava stakes. Standard plant extracts were prepared based on the combined procedures of Karim et al (1992) and Stoll (2000). The chemical fungicide was applied at the rate of 10 g per 20 liters of fresh water. Standard 1 kg of dried neem leaves powder was soaked in 5 liters of fresh water for 24 hours and filtered with muslin cloth before application. The ash extract was the National Root Crop Research Institute's standard ash and was applied by dissolving one sachet of 1 kg in 5 liters of fresh water. Twenty-five 2-node cassava stakes were soaked in the prepared plant extracts and the fungicide solution in a plastic container and left to stand for 10 min. After which, 25 stakes per treatment were packed into perforated transparent bags to a level sufficient to allow for the mouth to be tied with a rope or string, leaving enough empty space inside the polyethlene bags for air circulation. The bags were laid out in a randomized complete block design with five replications under tree shade. Estimation of number of sprouts were done by cumulative counting of the new sprouts on the cassava stakes from 3 to 6 weeks after placement in the bags and were converted to percentages. Sprouting vigour was estimated by measuring the length of the new sprouts using a transparent metric ruler. Fungus soot (black powder or substance on the surface of the cut stake) was estimated by recording the incidence (%) on cassava stakes during the experimental period of 6 weeks.

Data collected were analysed according to the procedure for a randomized complete block design using a Genstat computer program. The significance of treatment effect was done by Duncan's New Multiple Range Test (DNMRT) at 5% level of probability.

Results and Discussion

The sprouts, sprouting vigour, and the stakes infected by fungus soot were monitored during the experimental period in 2004 and 2005. The number of sprouts, vigour of sprouts and fungus soot were significantly ($p< 0.05$) influenced by the treatments. The maximum percentage sprouting during the two seasons ranged from 88% in 2004 to 97% in 2005 and was obtained by 2-node cassava stakes treated with standard neem extract. The minimum percentage sprouting during the two seasons ranged from 71.2% in 2004 to 68.7% in 2005 and was obtained by 2-node cassava stakes treated with standard ash extract. The vigour of sprouting was significantly enhanced by standard neem extract with a sprout length of 3.7 cm in 2004 and 4.3 cm in 2005. The vigour of sprouts was, however, lower across all other treatments in 2005 but fresh water sustained the lowest vigour (2.0 cm). The maximum number of stakes infected by fungus soot (black exudate or powder) during the two seasons ranged from 44% in 2004 to 52.1% in 2005 and was observed in the non-treated 2-node cassava stakes (fresh water). The minimum number of stakes infected by fungus soot during the two seasons ranged from 12.% in 2004 to 17.3% in 2005 and was observed in 2-node cassava stakes treated with Tecto -60 (chemical fungicide)

Sprout determinants, such as number of sprouts, vigour of sprouts, and fungus soot, were dependent on the treatments. Number of sprouts, and sprouting vigour were optimized by the application of standard neem extracts; the lowest fungus attack (soot) was obtained by 2-node cassava stakes treated with Texto 60 (chemical fungicide) and standard neem extract in the two seasons. This suggests that treatment of stakes with either standard neem extracts or chemical fungicide is necessary for minimizng fungus attack and sprout failure in the rapid multiplication of cassava. Higher percentage sprouting, sprouting vigour, and comparative low levels of fungus soot were obtained in stakes treated with standard neem extract in more than any other treatment, indicating that 2-node cassava stakes treated with standard neem extract resulted in a higher stake sprout performance, less fungus attack and sprout failure relative to chemical fungicide.

The ability of plant extract (standard neem) and (chemical fungicide) Tecto 60 to reduce fungus attack on the cut surface of 2-node cassava stakes was significantly similar. This suggests that the (standard neem extract) plant extract is the best local substitute for or alternative to chemical fungicide (Tecto 60) in the rapid multiplication of cassava. Neem is locally available and environmentally friendly. Similarly, Prakash and Rao 1997, Nwuzor et al (2005), Stoll (1998), and Offor (2004) reported the ability of plant extract (neem) in inhiting the growth of micro–

organisms in agriculture. In addition, Chelfant et al (1990) and IITA (1990) noted that neem is an effective fungicide, insecticide, and nematicide in controlling pests, diseases and micro-organisms that spoil agricultural produce.

In conclusion, the use of standard neem extract is recommended to farmers as the best local substitute for or alternative to chemical fungicide in the rapid multiplication of cassava.

Table 1: Number of sprouts, fungus soot, and vigour of cassava sprouts as affected by botanical extracts in 2004.

Botanical/ Chemical Fungicide	Percentage Sprouting	Sprouting Vigour (cm)	Fungus Soot (%)
Standard Neem Extract	88.0 a	3.7 a	15.2 b
Standard Pepper Fruit Extract	85.6 ab	2.5 b	25.6 b
Standard *Uziza* Extract	79.2 bc	2.3 b	12.8 b
Standard Ash Extract	71.2 d	2.3 b	13.6 b
Tecto 60-chemical fungicide (control I)	81.6 abc	2.8 b	12.0 b
Fresh water (Control II)	75.2 cd	2.9 b	44.0

Mean separation in columns by DMRT at 5% level

Table 2: Number of sprouts, sprouting vigour, and fungus soot as affected by botanical extracts in 2005.

Botanical / Chemical fungicide	Percentage Sprout	Sprouting Vigour (cm)	Fungus Soot (%)
Standard Neem Extract	97.0a	4.3a	16.7b
Standard Pepper Fruit Extract	90.4ab	3.1b	22.4b
Standard *Uziza* Extract	72.6b	3.0b	18.3b
Standard Ash Extract	68.7c	2.9b	20.4b
Tecto 60- Chemical Fungicide (Control 1)	87.4ab	3.4b	17.3b
Fresh water (Control 11)	79.7d	2.0c	52.1a

Mean separation in columns by DMRT at 5% level

References

Chelfant R.B., Joansson P.R., Scal D.R. and Schalk J.M. 1990. Ecology and management of sweet potato insects. Annual Review of Entomology 35: 157–180.

Das G.P and Karim A.A. 1986. Effectivenes of neem seed kernel oil as surface protectant against the pulse beetle. (*Callosobruchus, chinensis*). Grain and Legume Bulletin 33: 30–33.

Echendu T.N.C. 1991. Ginger, cashew and neem as surface protectants of cowpea against infestation and damage by *Callosobruchus maculatus*. Tropical Science 31: 209–211.

Eke-Okoro O.N., Ekwe K.C. and Nwosu K.I. 2005. Cassava stem and root production:
A practical manual. Atlas Press Umuahia, Nigeria. 52 pp.

Hawang J.S. 1994. Sweetpotato insect pest management in Taiwan. *In* Proceedings of the symposium on upland crop production. Council on Agriculture plant protection series No. 2 Taina District Agric. Improvement Station, Taiwan, Taiwan. ROC: 191–200.

IITA 1990. Cassava in Tropical Africa. A reference manual: 415 pp. IITA, Ibadan, Nigeria.
IITA 1999. Plant Health Management Division. Annual Report. 4–5. IITA, Ibadan, Nigeria.

Jansson R.K. and Raman K.V. 1991. Sweetpotato plant management. A global perspective Westview Press Inc., Boulder, Colorado, USA. 439 pp.

Karim A.N.M.R., Chowdhurg M.N.A. and Mozadd M.N.A. 1992. Current research on neem in Bangladesh. *In* Botanical pest control project phase 2. Proceedings of the final workshop 18–31, July 1992. IRRI. Los Banos, Laguna, The Philippines 30–32.

Nnodu E.C. and Okwuowulu P.A. 1990. Evaluation of fungicides for the control of leaf spot of ginger. Nigeria Journal of Plant Protection 13: 19.

Nwuzor E.C., Afuonye S.O., Okoriocha D.S. and Ezulike T.O. 2005. Studies on the use of neem leaf preparation to control *Cylas puncticollis* damage of sweetpotato root tubers. National Root Crops Research Institute, Annual Report, 2005. Umudike, Nigeria. 92–94.

Ofuya T.I. 1986. Use of wood ash, dry Chilli pepper fruits and onion scale leaves for reducing *Callosobruchus maculatus* damage in cowpea during storage. Journal of Agricultural Science (Cambridge) 107: 467–468.

Offor P.C. 2004. Pesticidal potentials of neem. National Root Crops Research Institute, NRCRI, Umudike Nigeria. Seminar series 2: 1–10.

Prakash A. and Rao Jagadiswari 1997. Botanical Pesticides in Agriculture. CRC Press Inc.

Florida,USA. 40 pp.

Sowummi E.O. and Akinwusi A.O. 1983. Studies on the use of neem kernel in the control of stored cowpea beetles. *Callosobruchus maculatus*. Tropical Grain and Legume Bulletin 27: 28–30.

Stoll G. 1998. Natural crop protection in the tropicsa and Sub-Tropics. AGRECOL, Switzerland 188pp.

Stoll G. 2000. Natural Crop Protection in the Tropics: Letting Information come to life. 2nd edition; Magraf Verlag, Germany. pp:101–139

Thiam S. and Dujommun. G. 1993. Protection Naturelle des vègètaux en Afrique. *In* Producing food without pesticides. CTA Postbus 300, 67 pp. A.J. Wageningen, The Netherlands.

Wheeler B.E.J. 1978. An introduction to plant disease. The English Language Book Society and John Wiley and Sons Ltd. Chichester. UK.