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*Review*

# Weed Control in National Root Crops Research Institute Umudike and its Recommendation

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**The reviewed paper, show cased the weed management practices in National Root Crops Research Institute, Umudike-Nigeria. Manual weeding involves weed control using small West African hoes and cutlasses. Yam is weeded 2 or 3 times at 3, 8 and 12 weeks after planting. Herbicides are recommended for weed control in yam, these includes pre- emergence application such as Atrazine at 1.5-3.0 kg ai/ha, Alachlor and metolachlor each at 2.0-3.0 kg ai/ha, Sinezine plus metolachlor at 1.5-2.0 kg ai/ha, while post emergence application is Gramoxone at 2.0-2.8 kg ai/ha applied at 21 days after planting. Cassava weed control involves manual weeding at 4, 8 and 12 weeks after planting while herbicides involved pre-emergence herbicides such as Atrazine applied at 2.0-3.0 kg ai/ha, Atrazine/ metolachlor applied at 2.5-3.0 kg ai /ha, Diuron applied at 1.5-3.0 kg ai/ha, while post emergence includes, paraquat applied at 0.5-1.0 kg ai/ha. Glyphosate or Roundup applied at1.8-3.6 kg ai/ha. Sweetpotato weed control involves manual weeding at 4, 6 and 8 weeks after planting while herbicides includes-pre-emergence herbicides-Atrazine/metolachlor applied at 1.5 kg ai/ha. Mixture of glyphosate+prometryn/s-metolachlor at 2.0-3.5kg ai/applied as early post emergence on Spear grass infested Sweetpotato field. Integrated approach involves the use of sweetpotato morpho-types- 87/0087 spread combine with mixture of Atrazine/metolachlor and fluazifopbutyl at 1.0-1.5 kg ai/ha applied at 14 days after planting (DAP).**

**Key words:** Weed control, Yam, Cassava, sweetpotato, NRCRI-Umudike.

## INTRODUCTION

Weeds and crops need similar growth resources from the soil and air, since they are found in the same piece of land at the same time. Providing favourable growing conditions for the root and tuber crop plants, while concurrently excluding undesirable plants (the weeds) represents the major essence of the Institute's agricultural pursuit in the last decade.

Generally root and tuber crops and weed responds similarly to the environmental factors involved in plant growth, such as water, light, air and nutrients. All these create competition and results in their sharing of available resources lead to reduction in crop yield (Unamma, 1984). Under some conditions root crops and weeds can grow together for at least a portion of the growing season without significant harm to the crop. However, some factors usually becomes limiting to plant growth and reduced yield of cassava, sweetpotato and yam, by 65%, 91% and 73% respectively (Akobundu, 1987). Successful root crop production demands that maximum economic yields be harvested from the land. To realize this goal, weeds cannot be allowed to deprive the tuberous crop plants of water, air, nutrients and lights. Therefore weed control plays a vital role in the production of root and tuber crops.

## ROOT AND TUBER CROPS

Many plants have an underground storage organ which accumulates mostly starch as reserve material. Of these, there are only four species or genera, of widespread importance: Yam, cassava, sweet potatoes and potatoes. All of them originate from the tropics, the first three from the low lands and the potato from the mountain areas of the south American Andes (Rehm and Espig, 1991).

The potato is mostly cultivated in the temperate zones;

only about 25% of the world production comes from the tropics and sub-tropics. Due to their diversity, few of these root and tuber crops have common ecological requirements. However, like root crops, they generally require deep, well-drained soils, which are well prepared before planting so that the underground portion can develop with restriction. Root and tubers contain up to 60% water when freshly harvested so that transport, over long distances is hardly worth while, in addition, the tropical species in particular can only be stored for a limited period of time. Where root and tubers are the main source of nourishment, the local population often suffers from protein deficiency, although the individual species differ greatly in protein content.

## WEED CONTROL IN YAM TO ENHANCE FOOD SECURITY

Yam (*Dioscorea* species) contribute more than 200 dietary calories per capita daily for more than 150 million people in Nigeria, while serving as an important source of income to the people. It provides multiple opportunities for poverty reduction and nourishment of poor people in the country (Babaleye, 2003). In South-eastern Nigeria, white yam (*Dioscorea rotundata*) is the most popular species. It has important cultural/traditional value to the people of the area; many important cultural values are attached to yam, especially during weddings and other social and religious ceremonies.

There has been increased in yam production in Nigeria over the years, especially, white yam species and others, in the South-eastern Nigeria, (IITA, 1988, Alimba and Ezinwa, 2001). In t National Root Crops Research Institute, Umudike (NRCRI) has contributed immensely in food security to the country by the release of new varieties of yam and transfers of technologies to the farmers, such as recommended weed control technologies.

Manual weeding involves weed control using small West African hoes and cutlasses. In Nigeria, yam is weeded 2or 3 times at 3, 4, 8 and 12 weeks after planting. Manual weeding in yam farms is efficient if carried out at the right times. Furthermore, manual weeding in yam may not be suitable for all soil types, since it may promote erosion in sandy soils and increase where rainfall is heavy. Continuous weeding may cause rottening of tuber due to increase soil temperature and reduced soil moisture. Manual weeding in yam is tedious and demands a lot of labour. This huge labour demand required in yam production in Nigeria increased production cost.

The use of herbicides is an efficient means of weed control in yam in developed agricultural systems. This is because herbicides application is cheaper than manual weeding and provides a good weed control during the critical stages of yam growth; however, herbicides usage in yam in the tropics is not widely practiced. This is due to lack of knowledge, lack of skill in herbicides application, lack of herbicide in small measures that can be purchase by farmers and the availability of recommended herbicides. Many herbicides are recommended for weed control in yam. These include:

**Pre-emergence applications:-**

- Atrazine = 1.5-3.0 kg active ingredient per hectare (ai/ha).
-TCA=5.0 kg ai/ha.
-Alachlor and metolachlor each at 2.0-3.0 kg a i/ha.
-Diuron each at 2-3 kg ai/ha alone or in combination with Alachlor at 2.0 kg a i/ha.
-Sinezine plus metolachlor at 1.5-2.0 kg a i/ha.
-Atrazine/metolachlor at 1.5 ai/ha.

**Post-emergence applications:-**

-Gramoxone at 2.0-2.8 kg ai/ha, may be applied post emergence at 21 days after planting.

Due to the fact that herbicides do not give a season long weed control in yam, there is need to complement chemical weed control with other weed control methods, such as integrated weed control. According to Unamma and Melifonwu (1988) yam field can be weeded once and twice at 3 and 12 weeks after planting when ‘egwusi’ (melon) is planted at 33,000 plant population per hectare to suppress weeds. Also Atrazine/metolachlor at 3.0 kg a i/ha did not give weed control beyond 8 weeks after planting and needed to be complemented with one hand weeding to provide effective weed control during the critical 3 months of yam growth (Melifonwu *et al*., 2008).

## CASSAVA

Cassava (*Manihot Spp.*) belongs to the family Euphorbiaceae and is the most important root crop grown in the tropics. The crop probably originated from South-America and was first introduced into Central Africa during the last part of the 16$^{th}$ century, into West Africa in the early 18$^{th}$ century and into East Africa in the 19$^{th}$ century (Jones, 1959). Cassava is thus a relatively new crop to Africa Agriculture. Hahn *et al*. (1987) postulated that cassava was rapidly adopted by farmers and integrated into the traditional farming systems of Africa because of the following factors.

i. Adaptability to traditional farming and food systems.
ii. Relative ease of cultivation and processing.
iii. Year-round availability and insurance against crop failure.

iv. Low input or resource requirements.
v. Relatve high yield of food energy (calories) per calorie of labour input.

Nigeria is the largest producer of cassava in the world with about 45 million metric tones (FAO, 2008). According to Asadu and Nweke (1999), cassava's adaptability relatively marginal soils and erratic rainfall conditions, its high productivity per unit area of land and labour, the certainty of obtaining some yield even under the most adverse conditions and the possibility of maintaining continuity of supply throughout the year make this root crop a basic component of the farming system in many areas of Nigeria. Famine rarely occurs in areas were cassava is widely grown, since it provides a stable base to the food production system. This indicates that cassava has the potential for eliminating food crisis and famine. The absence of cassava in the present farming and food systems of Nigeria would lead to catastrophic level of starvation and death for millions of people.

**Weed control in cassava**

Weed control in cassava involves manual weeding with hoes and cutlasses. Research conducted at NRCRI, Umudike, showed that weeding cassava field infested with *Mimosa invisa*. Mart. Every 28 days till harvest control weeds effectively than weeding at 4,8 and 12 weeks after planting. Chemical weeding using herbicides is another good option for weed control in cassava farms. Herbicides may be applied as pre-emergence or post-emergence herbicides. Some herbicides has been evaluated and recommended for use in cassava farms, includes:

**Pre-emergence herbicide:-**

- Atrazine applied at 1.5-3.0 kg kg a i/ha
- Atrazine/metolachlor applied at 2.5-3.0 kg a i/ha
- Diuron applied at 1.5-3.0 kg a i/ha.
- Xtrazine applied at 2.0-3.0 kg a i/ha.

**Post-emergence herbicides:-**

-Paraquat or Gramoxone applied at 0.5-1.0 kg a i/ha.
-Glyphosate or Round up applied at 1.8-3.6 kg a i/ha.

Lower rates of these herbicides are recommended for light soils, where as higher rates are recommended for heavy soils. Most post-emergence herbicides are non-selective and therefore must be directed to the weed only. Similarly an integrated approach can be used, and this involves the use of a combination of weed control methods to achieve desired results. Example the use of Xtrazine applied at 2.5 kg ai/ha + manual weeding at 12 weeks after planting, controlled *M. invisa* Mart. in cassava field effectively.

**SWEETPOTATO**

Sweetpotato (*Ipomoea batatas* [L.] Lam) is a creeper of the Convolvulaceae family. It originated from Central America and is widely grown as important staple food in most parts of tropical and sub-tropical region of the world. It ranks 7$^{th}$ among the world's major food crops. The crop has ceased to be "back yard crop or gap filler" as previously perceived. Survey reports in Nigeria show that production, Marketing and utilization have expanded in the last decade beyond its traditional central and riverine areas (Agboola, 1979) to almost all ecological zones in the country ( Tewe *et al.,* 2001). Presently, Nigeria is the largest producer of Sweetpotato in Africa with annual output of 3.46 million metric tonnes ( FAO, 2008).

Globally, Nigeria is the second largest producer with China leading with (106,197 million metric tones). The crop is grown for both human and animal consumption. Household income is supplemented by sales of the root tubers in local markets and urban dwellers. Its importance in starch, alcohol, livestock, Pharmaceutical and fertile industries cannot be over emphasized (wolfe, 1992).

The orange fleshed varieties with high B-carotene content have become very important in combating Vitamin A deficiency, especially in children.

**Weed control in Sweetpotato**

Weed competition has been identified as a major production constraint in Sweetpotato production in Nigeria (Unamma, 1984). Yield losses caused by uncontrolled weed growth have been estimated at between 42 and 65% in Nigeria. Over the years, National Root Crops Research Institute, Umudike collaborated with some Agro-chemicals in Nigeria to developed packages of weed control recommendations to farmers. According to Korieocha *et al.* (2006) weeding manually at 4, 6 and 8 weeks after planting controlled weed effectively. In order to reduce drudgery involved in manual weeding of large Sweetpotato hecterages, pre-emergence herbicides applications are recommended:

Atrazine/metolachlor applied at 1.5 kg a i/ha.
Mixture of glyphosate+prometryn/s-metolachlor at 2.0-3.5 kg a i/ha, applied as early post-emergence on spear grass infested sweetpotato field.

Similarly, an integrated approach can be used and this involves the use of sweetpotato morpho-types 87/0087

spread combine with mixture of Atrazine/metolachlor and Fluazifopbutyl 1.0-1.5 kg ai/ha applied at 14 days after planting. (DAP).

## CONCLUSION

Emphasis has been laid on the need to control weed growth in the farm early, so as to minimized the adverse effect, they may have on root and tuber yield. As much as manual weeding can be expensive at times, peasant farmers can still use it to control weeds in their farms, while large scale farmers can use chemical weed control.

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