

Aflasafe reduces exposure to cancer-causing toxins and promotes farmer access to premium markets

“If someone eats this maize, which may contain high aflatoxin levels, they may die and their death may be attributed to something else,” [Dr Alejandro Ortega-Beltran](#), a Plant Pathologist with the [International Institute of Tropical Agriculture \(IITA\)](#), says as he scrolls through pictures of nasty looking maize. Nasty, because it is rotten and covered by mold. “No way, no one eats that!” I protest! He keenly looks at me and adds, “When I was collecting crop samples, a woman in Mali was going to prepare a meal from this to feed her children. They cook the grains that are not too moldy—which may be highly contaminated—and give the rest to chicken and livestock...” A cold chill runs through my body causing me to mouth an unbelievable, “Really?!”

“Yes, really...” Ortega-Beltran emphasizes and then explains what aflatoxin and Aflasafe are. Aflatoxin is produced by fungi called *Aspergillus*. It is present in maize, groundnut,

sorghum, chili, millet, ginger, cassava, among other crops grown in the tropics and subtropics. Aflatoxin causes liver cancer but has worse consequences in children. Medical research has shown

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Aflasafe is a safe, natural solution to the problem of aflatoxin.

Former President Olusegun Obasanjo joins the bandwagon, elated about recent seed yam harvest

Wind back to mid-2019, to be exact 25 May. At [the commissioning ceremony](#) of the Senator Abiola Ajimobi Ring Road, Agricultural Transformation Building, and presentation of the OYSG Agricultural Policy Framework developed by [IITA](#) and NISER, President Olusegun Obasanjo expressed interest in setting up a one-hectare seed yam production for quality seed yam.



Members of the YIFSWA II team with aides of the former president.

This he said after seeing the robust and clean tubers of improved varieties from the Aeroponics System (AS) single node vine cuttings that were on display at the exhibition set up to promote some of IITA's innovations.

Following up on his expression of interest, [YIIFSWA-II](#) established a one-hectare field with minisetts of Kpamyo, and Aseidu topped with AS-derived seedlings of Kpamyo at President Obasanjo's homestead at Ibogun, Ogun State.

On 6 January 2020, President Obasanjo made the headline in Vanguard (i.e., [Obasanjo enters farm, harvests yam in Ogun](#)) as he led a team of harvesters to the field to harvest the seed yam farm established by the YIIFSWA-II project in June 2019.

On 9 January, his team invited YIIFSWA-II to assess the harvest, and advise on the sorting, treatment, and storage of the tubers harvested.

When asked about the former President's thoughts on the harvest, Mr Semiu Ayinla, who represented Chief Obasanjo, said he was elated about the yield, particularly the sheer volume and cleanliness of the seed tubers harvested. He was also pleasantly surprised by the taste of the freshly harvested tubers after roasting and boiling some of the tubers on the spot to feed the harvesters on the field. Ayinla said, "We were surprised that the newly harvested yam tubers that we roasted and boiled were firm and sweet. We enjoyed the yam."

President Obasanjo intends to use the seed tubers to establish a five-hectare ware yam field next cropping season.



Top: Freshly harvested seed yams.

Bottom: Obasanjo's aides sorting out bountiful seed harvest in makeshift seed yam barn.

Got a story to share?

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that the first 1,000 days in a child's life are critical for their development. So, when a child is fed on aflatoxin-contaminated food—and/or when exposed while in the womb—it may lead to stunting, wasting, poor mental development, and when the levels are too high, death can occur.

How aflatoxins cause liver cancer

When one eats aflatoxin-contaminated food, the liver tries to cleanse the toxin, but if one continuously eats contaminated food, the liver is overburdened, and eventually, it develops diseases such as cancer. The World Health Organization recommends the maximum level of aflatoxin in food to be no more than 10 parts per billion (ppb), but in parts of sub-Saharan Africa, food, especially maize and groundnut, may have 40,000 ppb.

In April 2004, 125 people in Kenya died due to exposure to high aflatoxin levels. A study that was carried out showed that aflatoxin-contaminated homegrown maize was the source of the outbreak. Fifty-five percent of the examined maize had aflatoxin levels higher than the Kenyan regulatory limit of 20 ppb, 35% had levels higher than 100 ppb, and 7% had levels higher than 1,000 ppb, some reaching over 40,000 ppb.

“Even a bull, huge as it is, would drop dead from aflatoxin levels of 40,000 ppb. It's like lacing food with poison and giving it to people,” Dr Ranajit Bandyopadhyay, a Principal Plant Pathologist with IITA explains.

Apart from affecting people's health, aflatoxin causes sub-Saharan Africa to lose millions of dollars in exports due to the high contamination levels in grains, which are rejected by the EU and other trading partners.

Armed with this knowledge of how the fungi contaminate crops, and its effects on human health and trade, IITA developed a biocontrol solution—Aflasafe. According to Bandyopadhyay, “Aflasafe is sorghum that is coated with beneficial strains of *Aspergillus flavus*, the major aflatoxin-producing fungus. However, not all strains of *A. flavus* produce aflatoxins. These non-toxin-producing strains (also known as atoxigenic) are the active ingredient in IITA's Aflasafe.

What is Aflasafe?

Aflasafe is a granular formulation made from sorghum that is dyed blue to differentiate it from regular sorghum. When a farmer spreads Aflasafe in their field before the plant flowers, the beneficial strains reproduce, and outcompete fungi residing in the treated field and prevent them from multiplying, and contaminating

the crop. Crops will always be exposed to aflatoxin because aflatoxin-producing fungi are found everywhere, especially in the soil. Aflatoxin is not an Africa-specific problem; the fungi that cause it are found across all tropical and sub-tropical areas of all continents. In the USA, where the biocontrol technology was developed, aflatoxin biocontrol products are approved for use in cotton, maize, pistachio, groundnut, almond, and figs.

When a farmer treats their field with Aflasafe, at the right time and the right dose (10 kg/ha), as well as follows good agricultural practices, the crop at harvest will have 80% to 100% less aflatoxins. In Africa, IITA has spearheaded the adaptation and improvement of the aflasafe technology. It is now being commercialized and adopted by farmers, agribusinesses, and governments across several African nations. In 2013, Aflasafe was registered for commercial use in Nigeria, which is currently the largest adopter with close to 100,000 farmers using it.

In addition, farmers in Nigeria under the recently-concluded AgResults Nigeria Aflasafe™ Pilot Project used Aflasafe and employed good agricultural, harvest, and postharvest practices. All these combined resulted in increased productivity from the national average of 1.5 ton/ha to 3.1 ton/ha. Increased productivity and higher crop quality (i.e., low aflatoxin content) have allowed farmers to increase their incomes by 16%.



Left: Muacheia Acacio, groundnut farmer, applying Aflasafe in Muriaze, Nampula Province, Northern Mozambique. Right: IITA scientist, Joseph Atehnkeng explaining to farmer how aflasafe works on maize.,

IYA celebrates success in its youth empowerment programs for 2019

Since its inception in 2012, the [IITA Youth Agripreneurs](#) (IYA) has been working tirelessly, creating capacity development programs and projects to engage youth in agribusiness. Although IYA has experienced challenges in accessing funds and credit facilities to assist some of the trained youth in establishing and expanding their agribusinesses, about 7,000 youth have benefited from the training.



Top: Evelyn Ohanwusi, Head of IYA Office, receiving the 2019 International Innovation Award for Sustainable Food and Agriculture. Bottom: Frotchery Farms team with Charlotte Sanginga, wife of IITA DG, showing off their NAFDAC certified products.

According to [Evelyn Ohanwusi](#), Head of the Youth in Agribusiness Office, "2019 was very eventful for IYA. We were engaged with agribusiness activities in about 10 countries of Africa including Nigeria, the Republic of Benin, and the Democratic Republic of Congo."

One of the many highlights of the year for the team was winning the [2019 International Innovation Award for Sustainable Food and Agriculture](#) at the 41st Conference of the [Food and Agricultural Organization](#) (FAO), in Rome. This was in recognition of IYA's commitment to improving both agribusiness

opportunities and the creditworthiness of youth across Africa. With the prize money, the team proposed and is setting-up an Agribusiness incubation program that would train and empower young people in the Republic of Benin.

In partnership with [Afe Babalola University](#) (ABUAD) and [AfricaRice](#), IYA implemented the Youth Employment in Agribusiness and Sustainable Agriculture (YEASA) project. The project, funded by [International Fund for Agricultural Development](#) (IFAD), aims to build the technical, entrepreneurial, and soft skills of youth between the ages of 18 and 35 in the Republic of Benin (Lokossa and Cotonou) and Nigeria (Oyo and Ekiti). This is meant to improve their productive capacity and facilitate the establishment of independent agribusiness enterprises. Trainees are awarded grants and start-up kits, after developing bankable business plans vetted by experts.

In Nigeria, two IYA businesses not only took-off but also secured the certification of the [National Agency for Food & Drug Administration and Control](#) (NAFDAC). Frotchery Farms Limited, producing smoked catfish, and Gracevine producing clean beans and yam flour.

In addition, IYA birthed a youth group known as the Youth Agripreneurship Global Limited (YAGL). YAGL is a profitable organization that aims to help 40 percent of its members become self-employed by either establishing independent agribusiness enterprises or organizations. The group serves as a link between IYA and the private sector.

Of all IYA's achievements, becoming an [Entrepreneurship Development Institute](#) (EDI) was the most important. As an EDI, IYA facilitates short entrepreneurship training for youth, after which the trainees are certified and recommended to financial institutions for loans at 5% interest rate, to establish small- and medium-scale enterprises.

Ohanwusi mentioned that IYA was able to achieve some of these feats through partnership and support of organizations. "We are open to more of this in 2020 as we aim to see more youth agribusinesses emerging, so we can continue to fulfill our mandate to the teeming unemployed African youth," she concluded.

YIIFSWA-II participates in Plant and Animal Genome Conference (PAG XXVIII) in San Diego

Billed as the largest Plant and Animal Genome meeting in the world, scientists from around the world converged at San Diego, California, USA, for PAG XXVIII from 11 to 15 January to promote research discoveries, exchange ideas, and gain new insights on plant and animal genome research and development.

YIIFSWA-II scientists, [Norbert Maroya](#) and [Morufat Balogun](#), participated in the conference and made presentations on “The effect of vine position of Aeroponics mother plant on the performance of seed yam production” and “Genetic fidelity of yam planting materials produced with novel high ratio propagation technologies based on morphological, ploidy and SSR markers” respectively, at the Yam Genomics workshop. Many other colleagues from [IITA](#) attended the meeting and made presentations.

In his presentation, YIIFSWA-II Project Leader and Principal Scientist of the yam Aeroponic System (AS), Maroya, indicated that cutting vines from different parts of the plant can affect both the survival and tuber yield from the single-node vine seedlings. After three consecutive years of cropping and tuber harvest under irrigation, the scientist observed a wide variance in the survival of seedlings and the size of tubers generated. Therefore, research was conducted to investigate the factors contributing to the variation.

When describing the methodology and results of the study, he stated that non-endophytic, clean plantlets from the Temporary Immersion Bioreactor System (TIBS) of two out of the three white yam varieties promoted by the project, Kpamyo and Asiedu were planted in the AS and left to grow for four months. After this, single node vines were cut from the top, middle, and bottom portions of the plant and planted in nurseries. After five weeks, he noted a significant difference in the survival and production of new shoots between the varieties and among the three types of vines. The survival rate of the single-node vines cut from the top, middle and bottom parts of the plant for the Asiedu variety was 94%, 55%, and 64%, respectively, and for the Kpamyo variety, it was 84%, 74%, and 70%, respectively.

Planted under rainfed conditions in the field, Maroya also noted significant variations among the three sources of



Dr Norbert Maroya presenting at the yam genomics workshop at PAG XXVIII.

seedlings. He said, “The varieties and the vines had substantial differences in the number of plants at harvest and sizes of tuber produced after six months in the field. The yields (t/ha) from vines from the top, middle, and bottom for Asiedu was 7.95 t/ha, 1.05 t/ha, and 2.54 t/ha, respectively and for Kpamyo it was 6.04 t/ha, 2.95 t/ha and 4.56 t/ha, respectively.”

He concluded that the result of the study demonstrates that vines from the top are more productive than the vines from the bottom and middle. Therefore, the specific need regarding tuber size should determine the position of vine cuts. However, there are fewer big size tubers under rainfed than on irrigation cropping.

In her presentation, Balogun, YIIFSWA-II Tissue culture specialist, indicated that the study was done to investigate and validate the genetic integrity of planting materials produced through High Ratio Propagation Technologies (HRPTs). “During the initial years of YIIFSWA-II, concerns were raised on genetic variance or deviation of plantlets propagated through a combination of HRPTs. Therefore, the study was conducted to verify if using HRPTs causes a genetic variation in the plant,” she said.

For the methodology, she indicated that the planting materials of four varieties of white yam were compared with their mother plants that were propagated with conventional methods. The varieties included two released improved varieties, Kpamyo (TDr 95/19177) and Asiedu (TDr 89/02665), as well as two popular registered landraces, Pepa and Amula propagated using HRPTs (Conventional tissue culture, Temporary

Immersion Bioreactor System (TIBS), AS, and Vine cutting technologies in seven different combinations). The samples were subjected to visual morphological assessment, ploidy level, and eight Simple Sequence Repeat (SSR) marker delineation. The test was done using twelve morphological descriptors, flow cytometry, and molecular techniques respectively. Balogun stated that the result showed that “twining direction, presence of hair, leaf margin, had 100% similarity within the population while other characters had 90% similarity. Flow cytometry did not show a significant variation of 2C DNA content among treatments as well as with their mother plant.

The number of alleles varied from 2 to 6 with an average of 4 per locus. The highest and lowest number was found with primer YM8 and YM69, respectively. Major Alleles Frequency (MAF) varied from 0.54 (YM69) to 0.79 (YM27) with an average of 0.63. Low genetic diversity was observed in the population analyzed due to the 0.51 value obtained for the heterozygosity. The polymorphic information content PIC ranged from 0.29 (YM27) to 0.56 (YM18) with an average of 0.45. The dendrogram generated by six informative out of the eight SSR markers used showed that the clones and their mother plants clustered together. Based on these findings, there is no genetic variation produced as a result of any of these high ratio propagation technologies.

The yam genomic workshop was set up to promote recent advancements in the development of genomic resources and related tools for yam to accelerate genome assisted improvement.