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Crop Product Profile

Vitamin A Maize Nigeria

02 Popular hybrids and varieties in Nigeria



Executive Summary

Nigeria has a population bigger than 190 million people. 61% of it. is estimated to live with less than \$1 a day and 69% live just below the relative poverty line of \$1.25 a day. Over two-thirds of its Nigerian population depend on agriculture for food and employment, and yet food and nutrition is a challenge.

Despite the reported improvements. deficiencies becoming alarming with children's anemia at 71%, vitamin A deficiency at 29.5% and more

than 21% of the total population being at risk due to the inadequate zinc intake.

Nigeria is the leading producer of many biofortified staple food crops in Africa particularly cassava, maize, sweet potato, yam, plantain/banana, cowpea, sorghum, millet and rice.

nutrition. То improve **Biofortification** must be deliberately and technically supported to make impact.

Besides food, maize is also useful as medicines and as raw industries. materials for In Nigeria, morphological а micronutrient characterization of maize are increasingly varieties is distributed in 48% dent, 14% floury, 14% flint, 13% waxy and 6% sweet maize.

Line	Туре	Developed by	Year of release	Main characteristics	Yield (ton/ha)
lfe Hyb 4	Hybrid	IITA, Ibadan, Premier Seeds, Maslaha Seeds, Maina Seeds	2012	Good yield potential, Medium Maturing, Intermediate level of pro- vitamin A content (8 ug/g)	6
SAMMAZ 39 (PVA SYN8)	OPV	IITA, Ibadan & IAR, Samaru, Zaria	2013	Intermediate level of pro- vitamin A content (6.4ug/g), high yield potential.	
SAMMAZ 38 OPV (PVA SYN2)		IITA, Ibadan & IAR, Samaru, Zaria	2013	Intermediate level of pro- vitamin A content (5.7ug/g).	6,4
SC 510 (Ife Hyb 3)	Hybrid	ISeed Co West Africa, Abuja, IAR, Samaru, IAR&T, Ibadan & IITA, Ibadan	20 West Abuja, maru, badan & badan		6
SAMMAZ 44 (LY1001-14)	Hybrid	IITA, Ibadan/IAR, Samaru, Zaria	2015	Intermediate levels of pro- vitamin A content (7 ug/g) and high grain yield	9,7
SAMMAZ 43 (LY1001-21)	Hybrid	lITA, Ibadan/IAR, Samaru, Zaria	2015	Intermediate levels of pro- vitamin A content (7 ug/g) and high grain yield	9,9
Sammaz 49 (LY1001-10)	Hybrid	IITA, Ibadan & IAR, Samaru, Zaria	2016	Good yield potential, Medium Maturing, Intermediate level of pro- vitamin A content (8.2 ug/g)	5
Sammaz 52 (PVA SYN 13)	OPV	IITA, Ibadan & IAR, Samaru, Zaria	2017	Good yield potential, Medium Maturing, Intermediate level of pro- vitamin A content (8.6 ug/g)	4

Yield values correspond to the average of the sites where the line is commercialized. *All the materials were developed and release funded by HarvestPlus

03. **Productive regions:**



Figure 1

Traditional maize production across the country

Region of the country	Percentage of contribution to total crop production			
North-East region (A)	28%			
North-Central region (B)	23%			
North-West region (C)	21%			
South-West region (D)	15%			
South-South region (E)	8%			
South-East region (F)	5%			

Figure 1: Maize production in Nigeria across six different regions.

Data source: Production data from federal ministry of agriculture and rural development/national bureau of statistics. Percentage values indicates percent regional production of total average production from 2008 – 2018.



04. Preferred planting and harvesting seasons for the crop in the country



Main Planting seasons

Planting season: July - August

Harvesting season: January - February

Top agronomic traits for biofortified maize in Nigeria





Early maturity

Relevance for adoption on farmers and producers

Reduction in the number of days to harvest will represent a greater income in a shorter period compared to other materials with late maturity and permits better chances to sell the production with a better price. Early maturity will let varieties enter the market when prices are still high and increase crop profitability.

Trait indicators commonly used for crop improvement:

Days to anthesis (Phenotypic) Days to maturity (Phenotypic) Heading seeding interval (Phenotypic)



Drought tolerance

Relevance for adoption on farmers and producers

Drought-tolerant varieties will develop acceptable grain yield even under stress conditions. This characteristic will allow incomes based on the commercialization of the production achieved in challenging environments.

Trait indicators commonly used for crop improvement:

Segregating populations under drought environment to evaluate: a) Nutrient acquisition/Uptake efficiency (Analytic) b) Water use efficiency Photosynthesis (Analytic) c) Radiation use efficiency (Analytic) d) Deep Root development (Phenotypic) e) Grain number maintenance (Phenotypic) f) Grain fill duration and rate. (Phenotypic)



Tolerance to low soil nitrogen (N)

Relevance for adoption on farmers and producers

Low soil nitrogen (N) tolerant varieties will develop acceptable grain yield even under deficient N soils. This characteristic will allow incomes based in the commercialization of the production achieved in nutrient deficient soils.

Trait indicators commonly used for crop improvement:

Segregating populations under deficient N soils to evaluate: a) No. kernels/ear (Phenotypic) b) Dry matter yield of stems and roots (Phenotypic) c) Grain yield (Phenotypic) d) N-uptake efficiency (Analytic) e) Utilization efficiency of N (Analytic)

Top agronomic traits for biofortified maize in Nigeria

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Striga hermonthica tolerance

Relevance for adoption on farmers and producers

Striga hermonthica tolerant varieties will be capable of survive the sustained presence of weed; this characteristic will allow an acceptable grain production under the infestation weed.

Relevance for adoption on farmers and producers

Ear and Stalk rot

Ear and stalk tolerant varieties will be capable of surviving even with the sustained presence of the disease lowering the risk of molds in grains which may develop production of toxic aflatoxins.

Trait indicators commonly used for crop

Selection pressure in segregating populations under infestation of Striga hermonthica to evaluate tolerance and resistance to the weed.

Trait indicators commonly used for crop

Selection pressure in segregating populations under infestation of Fusarium sp, Diplodia sp, Penicilum sp, and Aspergilus sp to evaluate tolerance and resistance to the disease.

Top agronomic traits for biofortified maize in Nigeria

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Maize streak virus tolerance (MSV)

Relevance for adoption on farmers and producers

MSV tolerant varieties will be capable of surviving the productive cycle even with the sustained presence of the disease. This characteristic will allow an acceptable production of the crop. In general, virus diseases are capable of severely affect any crop. Tolerance to this two of issues are mandatory.

Trait indicators commonly used for crop improvement:

Selection pressure in segregating populations under infestation of green leafhoppers (C. mbila Naudé and C. storeyi), feed with infested plants with the virus MSC in controlled environments to evaluate tolerance and resistance to the disease.



Army worm tolerance (Spodoptera frugiperda)

Relevance for adoption on farmers and producers

Pest management with different products is recommended to control this type of issue. However army worm tolerant varieties will be capable of surviving the completely productive cycle even with the sustained presence of the insect. This characteristic makes the plants less attractive for the insect feeding and helps to prevent a consequent death of the plant.

Trait indicators commonly used for crop improvement:

Selection pressure in segregating populations under infestation of Spodoptera frugiperda in controlled environments to evaluate tolerance and resistance to the disease

Top post harvest and marketing traits for biofortified maize in Nigeria





Kernel length/Kernel shape

Relevance for adoption on farmers and producers

The flour industry for bread and snacks requires medium to small sized maize, which hydrates more easily than the large ones; favoring the performance of the products made with flour. However, larger seeds are often preferred for fresh consumption of cob.

Dent com is often used as livestock feed, industrial products, or processed food preparations. Flint com is used for similar purposes as dent corn, however has hard outer shell, which make it more attractive for millers and retailers. Popcorn, a type of flint corn, has a soft starchy center surrounded by a very hard exterior shell.

Trait indicators commonly used for crop

The physical appearance of the kennels defines its price in the market, which is define by length and shape. Variations in size and shape are mainly genetic. Kennel length - Phenotypic Weight of 100 seeds (Phenotypic):<33g = Small 33-38g =r Large Xernel shape (Phenotypic) Visual Rank (Phenotypic) Flint(Phenotypic) SemiFlint (Phenotypic) SemiFlint (Phenotypic) Dent (Phenotypic)



Hardness of the Kernel

Relevance for adoption on farmers and producers

Determines the capacity of the grain to absorb and retain water during the different stages of the cooking process. For boiled consumption, usually soft or very soft grains are required. The dry milling industry requires hard or very hard kernels, to obtain good milling performance. The popcorn industry requires hard kernels. The flour industry prefers intermediate and soft grains, which is related to adequate cooking time of kernels at the time of making flour.

Trait indicators commonly used for crop

Flotation index of Kernels in sodium nitrate or sugar solution (Analytic):

Ranks: Very hard (0-12 FG), Hard (13-37 FG), Intermediate (38-62 FG), Soft (63 - 87 FG) and very soft (88-100 FG)

Hectolitic weight in 1 liter of H2O (Analytic): Hard (>75 kg), Intermediate (74-75 kg), soft (<74 kg)

Trait indicators commonly used for crop

Scale using the Minolta colorimeter (Lxaxb) or Smartphon app Techkon Color Catcher™ (Analytic)

L: Low intensity (black colors> Values closer to zero), High Intensity (White colors > Values closer to 100).

a: Negative values, green color (Low intensity closer to 0, high intensity closer to -100), Positive values, red color (Low intensity closer to 0, high intensity closer to 100).

b: Negative values, blue color (Low intensity closer to 0, high intensity closer to -100), Positive values, yellow colors (Low intensity closer to 0, high intensity closer to 100).

Color of the Kernel

Relevance for adoption on farmers and producers

The consumer's first approach to raw materials and processed foods based upon maize is because of its color, since it relates to acceptance or rejection. For maize, the most appreciate colors in the country are white which is related to flour industry which is associated with fresh consumption, animal feed and some minor cases of flour industry.

Top post harvest and marketing traits for biofortified maize in Nigeria





Milling performance ratio

Relevance for adoption on farmers and producers

It is a Key characteristic that contributes to give maize mechanical resistance during the post-harvest activities, which determines the integrity of the kernel during the harvesting, pre-cleaning and milling of the seed maize. For retailers, processors and flour industry, it's the most relevant trait for commercialization.

Scale of measurements

A) Ratio of milled dry maize (Analytics)

Pre cleaning of dry maize and moisture content below 14% are needed for this test. Milled dry maize remove the pericarp and part of endosperm layers. Weight of entire kernel, which remains after the milling and compare against the weight before milling expressed in milling ratio (%).

Weight of kernel after milling / weight before milling (Analytics) Ranks: High milling performance ratio (>70%), Intermediate (70% - 60%), Low (<60%)



Aflatoxins

Relevance for adoption on farmers and producers

Aflatoxins (mycotoxins) awareness in maize has grown due to their high influence in massive food; they are produced by fungi species (Fusarium sp, Diplodia sp, Penicilum sp, and Aspergilus sp). On the field they have more incidence in tropical climate with closer snages of 80 to 90% relative humidity and temperatures of 30 to 35°C. To reduce its incidence under storage, the raw material needs to be stored in dry and cold places to have longer shelf life. This issue can generate epidemiological effects in a short time (acute), as well as it could manifest in months or years (chronic).

Scale of measurements Ranks:

High > 5 ug/kg for dry maize

Quick reference guide

Characteristic	Fresh consumption	Flour industry	Popcorn industry
Kernel lenght	Large	Medium - Small	Small
Kernel shape	Flint	Semiflint - Dent	Flint
Hardness	Soft - intermediate	Very hard - Hard	Hard
Color	White - yellow - orange	White - yellow - orange	White - yellow - orange
Miling performance ratio	Not relevant	High - Intermediate	High - Intermediate
Aflaxotins	X < 5	X < 5	X < 5

Contact us:

If you have any questions or want to access to our germplasm, please contact our breeders:

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