International Scholars Journals

African Journal of Crop Science ISSN 2375-1231 Vol. 9 (1), pp. 001-006, May 2021 . Available online at www.internationalscholarsjournals.com© International Scholars Journals

Review

Production of soybean using biotechnology approach

M. N. Ishaq and B. O. Ehirim*

National Cereals Research Institute Badeggi, PMB 8, Bida, Niger State, Nigeria.

Accepted 12 May , 2021

Soybean production in Nigeria has increased tremendously through the performance of improved varieties. This is as a result of increased demand for the crop. Production cannot however meet the demand due to various challenges faced by the crop. This range from biotic factors like rust to abiotic factor like pod shattering. Using biotechnological approach has provided some solutions to trait improvement in diseases, pest, grain yield and nutrient enhancement of the crop. Biotechnological tools have helped in solving some production constrains like weed (development of Round-up ready soybean varieties) which has enhanced and increased soybean production worldwide. New varieties have also been incorporated with improved nutrient content and disease tolerance. Despite these efforts however, biotechnology faces some challenges due to cost, consumer test and environment acceptability.

Key words: Soybean, productivity, biotechnology, Nigeria.

INTRODUCTION

Soybean [*Glycine max* (L.) Merr.] is a legume crop with high protein content (40%) and high-quality oil (20%) (Osho, 2003). Soybeans are the primary source of the world's supply of protein and vegetable oil. The demand for increased production of soybeans is forecasted to mirror the world's population growth and demand for protein and edible oil. Soybeans are grown in many parts of the world and are a primary source of vegetable oil and protein for use in food, feed, and industrial applications (Endres, 1992, 2001). Soybean was domesticated in the eleventh century BC around northeast China (Hymowitz and Shurtleff, 2005). It may have been introduced to Africa in the nineteenth century by Chinese traders along the east coast of Africa (Giller and Dashiell, 2006).

Reports indicate that soybean was cultivated in Tanzania in 1907 and Malawi in 1909 (Giller and Dashiell, 2006). African countries with the largest area of production are Nigeria (650,000 ha), South Africa (245,000 ha), Uganda (147,000 ha), Malawi (79,480 ha), and Zimbabwe (69,900 ha).

Nigeria is the largest producer of soybeans in Africa. Soybeans were first introduced into Nigeria in 1908 (Fennel, 1966), but the first successful cultivation was in 1937 with the Malayan variety (undated), which was found suitable for commercial production in Benue State (Oyekan, 1985). The producing areas of Central Nigeria have been responsible for a large proportion of the domestic requirement of this cheap source of plant protein. Today, soybean has made a successful incursion into the diet of many Nigerians, particularly children and nursing mothers. Soybean derivatives such as soy-gari, soymilk, soy-ogi and soy-lafun have been developed and found to be good substitutes for food ingredients like

*Corresponding author. E-mail: erries007_ben@yahoo.com.

Table 2. Soybean production figures for some States in Nigeria (2007-2011).

Year	Production in metric tones					
	Nasarawa	Katsina	Kano	Oyo	Benue	Kaduna
2007	2390	1980	2609	2700	1748	1125
2008	2710	3052	4723	2700	1798	1069
2009	4370	3518	6552	2800	1817	1126
2010	6350	3514	6582	2900	-	1078
2011	2390	-	1259	2800	-	-
			Area in Hectares			
2007	3400	2041	1870		8783	7533
2008	2120	2563	2559		9033	7373
2009	3730	2550	6094		9084	7529
2010	5800	2647	9890		-	6878

Table 3. Grain yield (kg/ha) performance of TGx 1987-62F and TGx 1987-10F in multilocation trials for three years in comparison with check varieties in Nigeria.

Variety	2008	2009	2010	Mean	% increase over TGx 1835-10E	% increase over TGx 1485-1D
TGx 1987-62F	2241	1334	1946	1841	41	50
TGx 1987-10F	2161	1225	1770	1719	32	40
TGx 1835-10E		1005	1599	1302		
TGx 1485-1D	1699	574	1412	1228		
Trial mean	1891	1126.4	1892.5	1637		
SE	92	142.2	128.5			
P (Variety)	0.0001	0.0000	0.0001			

Soybean breeding vs Biotechnology

Today, the modern soybean breeder has additional tools provided by biotechnology to develop improved soybean varieties. Although modern biotechnology will never replace conventional breeding research, but rather will enhance and improve upon the efficiency of plant breeding. Biotechnology tool can genetically engineer soybean plants with unique genes, but plant breeding is necessary to put the new trans-genes via sexual reproduction into the proper genetic background so that it is adapted to the intended areas of use. For example, genetically engineered plants from the laboratory are often poor seed yielders, do not have insect or disease resistance, do not have the proper maturity, and so forth to compete with existing varieties in the market. This is because such varieties have not been exposed to the hazard of environment. Seed yield is of paramount importance, because growers cannot profitably grow new varieties aided by biotechnology if they are not competitive in yield to the best varieties already in the market.

According to Frey (1996), there are a number of factors that plant breeders need to consider before using biotechnology to develop new improved varieties. These include: "(a) the need for and utility of genes accessible only from incompatible species; (b) the relative costs of biotechnology and traditional breeding methods for cultivar development; (c) the relative ease whereby plant traits can be manipulated with biotechnology versus traditional breeding methods; (d) the distribution of the benefits of biotechnical inventions; and (e) the acceptance of genetically modified crop cultivars by farmers, society, and regulatory agencies. Cost is a considerable factor in determining whether to embark on soybean development using biotechnology. The controversy usually surrounds the consumption of GM cultivars and not biotechnology per se (Frey, 1996). Individuals do not generally object to the tools provided by plant biotechnology, such as tissue culture, marker-assisted selection (MAS), quantitative trait loci (QTLs), chromosomally engineered plants, genomics, and so forth. It remains to be seen if the world's people will openly embrace biotechnologically derived crop plants,