Coping with wheat in Pakistan in the wake of green biotechnology, nanobiotechnology and food sovereignty

Siddiqui KA

HEC Eminent Professor of Biotechnology, Genetics Engineering and Environmental Sciences, University of Sindh, Jamshoro

ABSTRACT

Wheat has remained the central theme of self sufficiency in Pakistan. Conventional wheat breeding has remained highly successful in Pakistan by sustaining and enhancing the so-called Green Revolution. Since 1963, when I first participated in the Second IWGS at Lund, Sweden, highly significant and far-reaching developments constantly taking place in wheat sciences. In 2008, we are having very exciting time globally in genetic engineering and biotechnology when methods are constantly progressing to improve microarray quality control and to use transcription factors to discover unknown signal pathways. Simultaneously metabolomics has emerged as a significant player in the areas of genomics, proteomics, genetic engineering, biotechnology and nanobiotechnology. In 2008 numerous nanodevices and nanosystems for sequencing single molecules of DNA are feasible. Nanobiotechnology will play an important role in the study of systems biology-also referred to as pathway, network, or integrative biology-in which proteomics play an important role. Nanobiotechnology will provide refined tools for the study of genomics and proteomics, real time single particle tracing in living cells, and dissection of signaling pathways. As a supplementary approach to overall wheat improvement, green biotechnology should make a significant contribution. For facing the challenges of 21st century successfully it is necessary to identify and assess the frontiers not only in wheat biology (including green biotechnology) and agriculture but also in economics, sociology, ethics, international trade and politics in the wake of globalization, poverty alleviation and food sovereignty.

Wheat is the most important food crop of Pakistan and has remained the central theme of self-sufficiency programme in the country. Wheat claims three times the area and twice the value added share of cotton and rice, which are Pakistan's two main export earners. National wheat production increased from 4 million tonnes in 1965-1966 to over 7 million tonnes in 1968-1969, making Pakistan the first developing country in Asia to achieve self-sufficiency in wheat production.

In 2008, coping with wheat phenomenon is still problematic in Pakistan. We have to address not only wheat genetics and biology (including green biotechnology) and agriculture but also the economics, sociology, ethics, international trade and politics in the wake of globalization, poverty alleviation and food sovereignty [**Siddiqui, 2007**]. In Pakistan wheat breeding is being vigorously pursued to evolve good quality high yielding varieties with wide adaptation and resistance to biotic and abiotic stresses. A main successful story is the evolution of bread wheat variety Sarsabz which was approved for general cultivation by the Government in 1986 and in 2008 it still dominate wheat growing acre in Sindh (57%) and Baluchistan (52%).

The average grain yield in Pakistan is around 2.2. mt/ha. Progressive farmers with recommended package of technology obtain 6 mt/ha. Some landless farmers have become the owners of the land by cultivating Sarsabz.

Jauhar 78 is the first variety of bread wheat in the world evolved with the help of fast neutrons. Pavon variety introduced from Mexico was the most successful wheat variety during Post Green revolution period up 1978. Jauhar 78 became instant hit with the farmers, not only for higher grain yield but also because of its attractive amber grain colour for chapati (unleavened bread) making. In Pakistan of threshers, at the time of harvest results in significant grain losses due to shattering with rise in atmospheric temperature. Jauhar 78, endowed with shattering resistance was a significant advantage for farmers.

In Pakistan, salinity and water logging are great menaces and in recent years efficient plant breeding cannot be done without the active help and collaboration of farming community. Although Jauhar 78 was not specifically bred for salt tolerance, farmers reported that Jauhar 78 can give up to 2 ton/ha on salt affected lands. It is interesting to note that average national yield in Pakistan is around 2 ton/ha.

WHEAT VARIETY SIGHAT 90

Bridging the gap between grain yield and protein quality on one hand and between protein quality and protein content on the other hand has been one of the main concerns of contemporary plant breeding between high grain yield and protein content and quality. Soghat 90 was evolved through use of sodium azide (0.001 M, 2hrs). Soghat 90 has 25% more protein than Pavon (parent). The variety is also characterized by high grain yield and high biomass with inbuilt disease resistance.

BRIDGING THE TECHNOLOGICAL GAP

In Pakistan, transfer of technology is slow. Even amongst the so-called progressive farmers, there is significant technological gap in the utilization of high

yielding varieties evolved during post Green Revolution era (Table-1).

Table 1. Technological gap amongst farmers in utilization of high yielding wheat varieties

Name and address of the grower	Grain yield (kg/ha)		
	Sarsabz	**Kiran 95**	**Soghat 90**
Mr.Nazir Ahmed Lashari, Sakrand	-	4200	-
Maj. ® Haji Amanullah, Shikarpur	11200	9700	-
Mr.Abdul Ghani, Tando Bago	8960	-	-
Ch. Abdul Qadeer, Faisalabad	-	5000	-
Gahi Darya Khan Nizamani, Tando Qaser	-	3200	-
Mr. Abdul Reham Bhutto, Madeji	-	-	4400
Ch. Rifat Naveed, Taluka Diplo	2700	2950	-
Mr. Habib Baig, Shahdarpur	-	4350	-
Syed Fajar Ali Bukhari, Tando Allahyar	4500	-	-
Dr. Abdullah Ghanghro, Larkana	3000	-	-
Mr.Khalid A. Khan, Shahpur Sargodha	4500	4500	4000
Dr.Arif Qazi, P.M.C., Nawabshah	-	4137	4025
Mr.Ghulam Mohayyuddin Khoso, Rohri	-	5000	-
Hafiz Abdul Haq Khoso, Rohri	-	-	5000
Average over sites	5810	4782	4356
No. of sites	6	9	4

Yield of Pak 81 reported by farmers = 4000 kg/ha.

In wheat variety Sarsabz, grain yield ranged from 2700 kh/ha to 11,200 kg/ha. In variety Kiran 95, grain yield ranged from 2950 kg/ha to 7900 kg/ha, but in wheat variety Soghat 90 the gap was not very wide.

REFERENCE

Siddiqui, K. A. 2007. Green biotechnology at the crossroads of nanobiotechnology, globalization, poverty alleviation and food sovereignty', *Indian J. Crop Science* 2(1): 1-4. (ISSN 0973-4880).