

Selection in humanity's favour

What is the selection role of the wheat for its yield increasing on a world scale

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The writing of the present material is a try to be analyzed the selection role of the wheat for its yield increasing on a world scale. Generation of selection scientists were working to improve the wheat with noble goal for fully feed the humanity. Till present these conditions continue but more organized, motivated and purposive. The researches of all sciences regarding the selection are used at maximum level. The coordinators who are the most expressed world scientists about the wheat, are set the ambitious task in the 40-50 years the wheat yield to become 900-1000 millions tones. In front of the headlong increasing of the world population and provided that the area offset forth cultures stays comparatively stable, this might be done only at two lines – by selection and by totally consistent with the concrete conditions technology. At the current tendencies of wheat selection and technology, this means near 20% increasing the average yield from 3.25t/hectare to near 4.10t/hectare. Detailed analysis has been done for the real opportunities of this purpose's realization.

Wheat: still the main food of the humanity

The wheat is one of the first cereals that have been cultivated by the people. The ability for self-pollination additionally facilitates the team of many varieties in specific regions in the world. The archaeological findings indicate that at first the wheat was cultivated in the area of the Fertile Crescent and near the Nile delta. This includes the South-Easterly Turkey, Syria, Lebanon, Israel and Egypt. Comparatively new studies indicate that the first cultivation of the coarse-grained spelt (*Triticum monococcum*) was implemented in small area in South-Easterly Turkey. Because there are evidences for the barley usage by the people dated 13th century B.C., there are hypothesises that the wheat were used as a food before it.

Cultivated at first in the region of the Near East, the wheat gradually has been widespread all over the globe. 2.5 mlrd deceres are sowed annually. In 2014 the wheat yield becomes 723 million tonnes on a world scale which ranks second among the three most important grain cultures – maize (984 million of tones) and rice (484 million of tones). With its unique genome result from a spontaneous cross-fertilization of other grain cultures, the wheat is situated on the top of the grains' pyramid because of the fact that it is used to feed the human being. That is why it was very important factor that allowed the creation of very organized societies during the origins of the human civilizations. It is one of the first cultures cultivated on a large scale because of its high yield, easy transportation and tolerance against long-time storage. The wheat is the main source of protein in the human's food because it is characterized with higher protein substance comparing to the maize, rice and the other similar cultures. It is well-known that near 70% of the world population use wheat bread. The wheat germs are important source of vitamins, mineral salts and proteins and they are applied in many culinary products. The data from the past 5 years indicate that the wheat grain as a food provides globally near 21% of the human's power and it exceeds the maize (20%) which world yield is near 30% larger.

The role of the "native" selection

The purposeful grain selection of varieties in which they are easier separated from the weeds gradually leads to creation of cultivating varieties. These forms that give certain characteristics had been a biological choice for the farmers. At the domestic wheat varieties comparing to the agrarian ones, the grain is larger but the seeds are heavier attached to the ears which preserves the grain from injure before the harvest. The selection of easy harvest varieties was not completely conscious and probably was a result of the simple harvest that was suffered the required marks – unhealthy attached seeds were felt away during the harvest. Independently the selection reasons, the result was gradually cultivating the wild wheat to many local varieties. Several thousand cultivating years are the reason these varieties even to lose gradually their natural mechanisms for seeds spread. This is the reason the cultivated varieties not to survive in normal wild ambient without human interference.

Short story of the current selection

In the present the selection is a science and by its efforts the last word in the science of the yield is adopted directly by the created varieties, hybrids, branches and so on. By this reason, this activity must be stable in time, orderly as human efforts and at the same time dynamic as approaches and methods. It takes advantages of the newest achievements in the world science and at the same time the results from it are directly connected to the climate-soil conditions of the country. As a result of this annual unforeseen interaction between genetics of set culture and the cultivation conditions, create unique combinations of signs and characteristic, useful to the maximum for the

person in particular region. By this the selection is a constant innovation supplement of the science (many scientific disciplines) in the practice.

The current "scientific" wheat selection has become only in 19th century. The reasons are the collected knowledge in the science which has direct connection to it. genetics, physiology, morphology, botany and other sciences that began to be more investigated by the people. The information for concrete methods and results are published only in the end of 19th century. There is information for purposeful selection in Russia, USA, Canada, Australia, France, Germany and Italy but they are more a hobby than a real selection. Probably the earliest publication about selection in Germany is made by Koelreuter (1776). Later after the publishing in 1866 genetic laws on the Mendel's heredity, near 1875-1880 appeared the first wheat varieties in France (Vilmorin), in Germany (Rimpau), in Canada (Marguis), in USA (Pringle) and in Australia (Robin). Only two principles were applied: the team did not create genetic diversity but only fix it and the selection is effective only by principles which have been derived. In the end of the century and in the beginning of the 20th century the first varieties have been created by Strampeli in Italy, which are children of sexual hybridization. During the 30 years of 20th century Nikolay Vailov made epochal world scientific expeditions and determined geographic (genetics) origin centres of culture plants. Describing in details many varieties of grain cultures, he gave a great stimulus to the current selection.

The wheat selection: effective agriculture science

Its rapid and effective movement in the world became after the Second World War and the varieties that have been created in different countries, have local character. Immediately after the War, the International maize and wheat improvement centre have been



created in Mexico (CIMMYT). Financed by FAO, this centre succeeds for a period of near 40 years to create great number wheat varieties which are spread all over the world mainly in developing countries. One of its founders and active selectionists is the American scientist Norman Borlaug. He is the ideologist and the direct organizer of "green revolution" in the agriculture. For this international process hundred books were written but the most important is that the selection activity was transformed to main factor that increase extraordinary the wheat yield (figure 1). By this reason Borlaug Nobel prize winner for peace in 1971 for his phenomenal contribution to feed the humanity by selection. In some of the countries the yield had increased more than three times. As a whole the wheat yield in the world in the years after 1970 till nowadays has increased over two times (table 1).

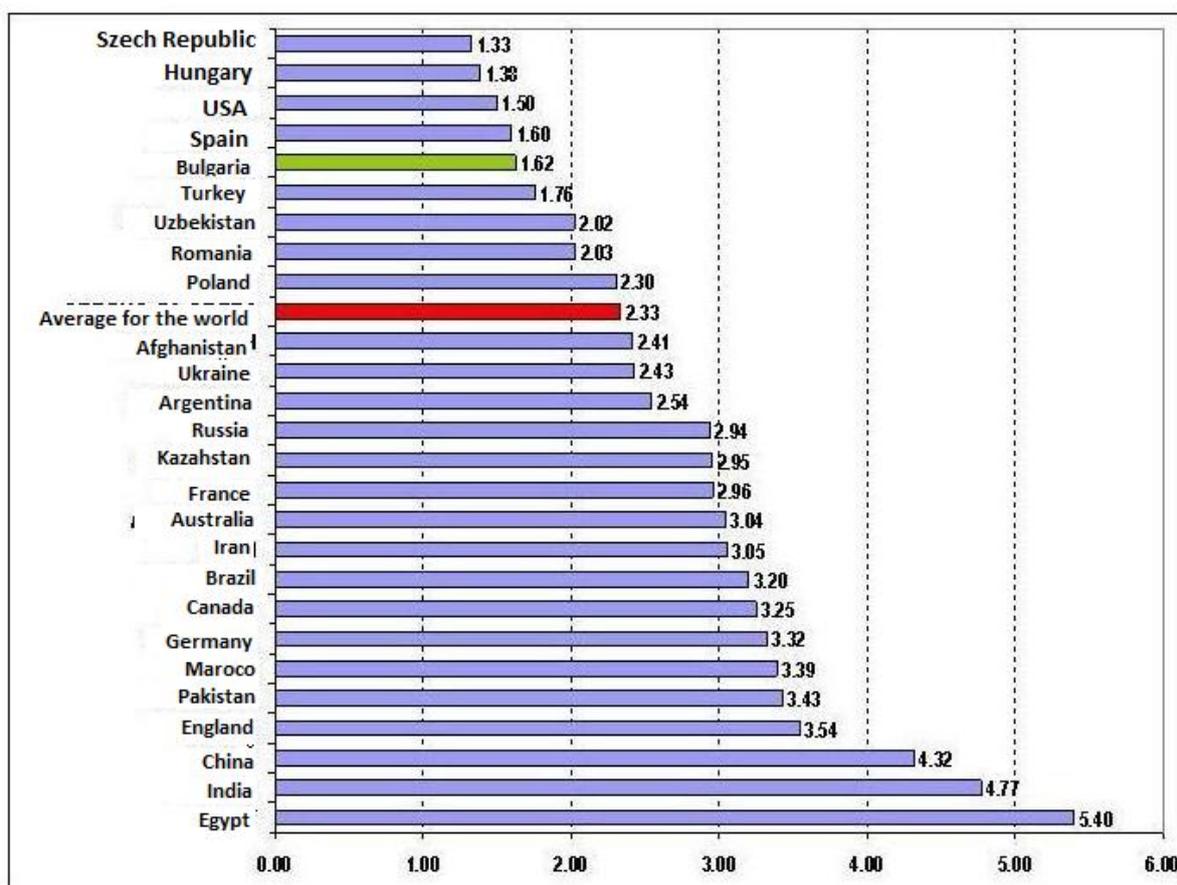


Figure 1. Wheat yield increasing (at times) in 2015 comparing with 1970.

Unusual big impression in this connection makes countries as China, India, England, France, Russia, etc. where great wheat areas have been cultivated. China and India are the countries with the greatest yield coming now to 28% of the world one. The greatest yield as a result of the selection is the yield of the spring wheat. There the selection is very intensive (two generations annually). The progress is lower but significant in the winter wheat which is cultivated in our country. The most advanced countries in the selection are England (3.54), Germany (3.32), Canada (3.25), France (2.96), Russia (2.94), Ukraine (2.43), etc.

Table 1. Wheat yield in countries with yield over this in R. Bulgaria after 1970.

Nº	Country	1970	1980	1990	2000	2010	2015 *
1	China	29.188	55.212	98.231	99.636	115.180	126.000
2	India	20.09	31.830	49.849	76.368	80.710	95.850
3	Russia	20.093	29.830	31.830	34.455	41.507	59.000
4	USA	36.784	64.799	74.294	60.639	60.102	55.129
5	France	12.649	23.781	33.345	37.353	38.207	37.400

6	Canada	9.024	19.292	32.098	26.535	23.166	29.300
7	Germany	7.794	11.253	15.241	21.621	24.106	25.900
8	Pakistan	7.294	10.856	14.315	21.078	23.310	25.000
9	Ukraine	..	..	..	10.197	16.851	24.750
10	Australia	7.889	10.856	15.066	22.108	22.138	24.000
11	Turkey	10.081	16.554	20.022	21.008	19.660	17.700
12	England	4.237	8.470	14.033	16.704	14.878	15.000
13	Iran	4.262	5.849	8.011	8.087	15.028	13.000
14	Kazakhstan	4.237	5.366	7.777	9.073	9.638	12.500
15	Argentina	4.920	7.974	11.036	16.146	14.914	12.500
16	Poland	4.607	4.175	9.025	8.502	9.487	10.600
17	Egypt	1.519	1.736	4.268	6.564	7.177	8.200
18	Uzbekistan	..	..	..	3.532	6.730	7.150
19	Italy	9.688	9.156	8.108	7.463	6.900	7.000
20	Romania	3.356	6.264	7.289	4.456	5.811	6.800
21	Spain	4.062	6.039	4.773	7.293	5.610	6.480
22	Maroco	1.800	1.811	3.613	1.380	4.876	6.100
23	Brazil	1.844	2.701	3.093	1.661	6.036	5.900
24	Czech Republic	.	..	..	4.084	4.161	5.430
25	Denmark	0.512	0.652	3.953	4.693	5.059	5.050
26	Hungary	2.722	6.077	6.198	3.692	3.763	5.050
27	Afganistan	2.081	2.550	1.650	1.469	4.532	5.020
28	BULGARIA	3.031	3.846	5.292	2.781	3.994	4.920.
	WORLD	310.740	440.187	592.310	585.690	650.881	724.760

* - prognosis in March 2015

A great development has the selection in the ex-USSR after 1945. Only 10 years after the Second World War in the Science Institute of Wheat in the town of Krasnodar, a Bezostaya 1 variety has

been created. Subsequently it became the world largest used variety in the selection because it's unique combinations between useful agriculture qualities and high adaptability. Its author is the Russian Pavel Lukayanenko who together with the American Norman Borlaug and the Italian Nazareno Strampeli are considered as pioneers of the current wheat selection because of the fact that their varieties became a real fundament for notable progress of selection in different parts of the world.

Our country together with some of the socialist countries has lower (1.62 times) yield increasing comparing to the international level (2.33) But yet R. Bulgaria takes the 28 step (0.6%) by wheat yield in the world and takes a part every year in the grain trade with a part near 1.5% in front of the near 160 million of tones. This is because the productive selection in our country during the past 50 years, which we will discuss later.