

TB 02-20: A COMMON BEAN (*PHASEOLUS VULGARIS* L.) GENOTYPE WITH FAVORABLE ZINC (ZN) AND IRON (FE) CONTENT

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INTRODUCTION

The richness represented by the agrobiodiversity found in the different species that make up the food universe, has been recognized at the global level. The United Nations (UN), according to the understanding that there is a need to eradicate poverty and hunger in the world, promoting a dignified life for all, formulated the Objectives of Sustainable Development – OSDs, composing the “2030 Agenda for Sustainable Development”. In its second objective, the Agenda has as one of its goals the access of all people to safe and nutritious food. As a reflection of this recognition, the search for food that have favorable nutritional profiles has become a priority. From a nutritional point of view, common bean (*P. vulgaris* L.) has adequate levels of several essential nutrients for humans and, due to this characteristic, can be a substitute for other sources, such as meat, when considering the protein content, for example, which implies in a favorable condition for low-income populations. In addition to a high protein content, common beans are also a source of other nutrients, such as calcium and iron, B complex vitamins, dietary fiber, carbohydrates and several essential amino acids. In order to contribute to the reduction of existing malnutrition in many countries, in 2002 the Consortium of International Agricultural Research Centers - CGIAR, an international organization that coordinates international agricultural research programs, approved the project entitled Biofortification Challenge Program, later renamed Harvest Plus. Among its goals, it proposed the biofortification of food species, making them higher in certain nutrients. Common bean was one of these species, and the goals included increasing the levels of Zinc (Zn) and Iron (Fe). This article reveals the strategy developed to identify the line TB 02-20, a genotype with high Zn and Fe content and high seed yield.

MATERIALS AND METHODS

TB 02-20 is a selection that was performed from a landrace population of common bean that was added to the germplasm bank of Embrapa Clima Temperado in 1999 from a donation by an extension agent. The “TB” letters corresponds to the identification for selections of common bean conducted at Embrapa Clima Temperado; “02”, corresponds to the year of selection, and 20, to the order of the selection. **Nutritional characterization** – Nutritional analyzes related to seed content of Zn and Fe of TB 02-20, have been conducted at Embrapa Agroindústria de Alimentos, in 2014, and at Embrapa Clima Temperado, in 2018, Brazil. Besides TB 02-20, an additional 25 genotypes, part of the common bean research program of Embrapa Clima Temperado, were evaluated for the analyzes at Embrapa Agroindústria de Alimentos, with the seeds derived from a field experiment carried out at Pelotas, State of Rio Grande do Sul, in 2013. The analyzes made at Embrapa Clima Temperado, comprised, besides TB 02-20, additional 13 genotypes, and the seeds wer obtained from experiments conducted in the municipalities of Sobradinho and São Luiz Gonzaga, both in Rio Grande do Sul in 2011/12. **Yield performance** - The submission of TB 02-20 for evaluation in field experiments to determine the Cultivation and Use Value – VCU in Rio Grande do Sul, one of the requirements for registration at the Ministry of Agriculture, included years 2006/07 – 2010/11, that is, five agricultural years. In this period, they were planted in the two common bean

sowing seasons in the State, namely, 19 in the spring season, corresponding to spring sowings, and seven in the summer season, corresponding to summer sowings, thus summing up to 26 experiments. Experiments were carried out in 10 different municipalities located at Rio Grande do Sul State. VCU experiments were composed under a Complete Block Design, with four replications, four 4m-row plots and a seed density corresponding to 240.00 plants/ha. A by-local analyze of variance was conducted and a Scott-Knott mean comparison followed.

RESULTS AND DISCUSSION

Fe and Zn content - Results on the performance of TB 02-20 reveal that, compared to the results obtained for the additional genotypes subjected to the trial, this genotype possesses a quite favorable content both for Zn and Fe. TB 02-20 showed the highest Fe content (85.997 mg/kg – under a spectrum that ranged from 55.517 to 85.997 mg/kg), and the second highest content of Zn (37.373 mg/kg - under a spectrum from 25.631 to 39.963 mg/kg), among the 26 genotypes, from the analyses carried out at Embrapa Agroindústria de Alimentos. From the evaluation conducted at Embrapa Clima Temperado, with seeds of 14 genotypes from experiments carried out in the municipalities of Sobradinho and São Luiz Gonzaga, both in Rio Grande do Sul, in 2011/12, TB 02-20 also had the highest Zinc content in Sobradinho (31.67 mg/kg, under a spectrum of 26.00 to 31.67 mg/kg), and a medium response in São Luis Gonzaga (26.44 mg/kg - under a spectrum of 22.57 to 32.58 mg/kg). For Iron content, in Sobradinho, TB 02-20 reached the highest value (120 mg/kg, for a spectrum of 80 to 120 mg/kg) and), and a below-average in São Luiz Gonzaga (70 mg/kg, under a spectrum of 60 to 100 mg/kg). Its important to observe the higher Iron content found in Sobradinho and São Luis Gonzaga as compared to that found in Pelotas, and a similar content for Zinc at these locations. The results point out to the high performance of TB 02-20 for Zn and Fe content in seeds from distinct environemnts, what implies in a favorable condition for this genotype in achieving the goals proposed by the CGIAR, considering being a selection from a landrace. **Yield performance** – TB 02-20, from the 26 experiments carried out, in 14 of them was statistically identical in seed yield to the best genotypes in the average comparison tests, such results in 10 of the 19 spring season experiments and in four of the seven summer season experiments. Likewise, it showed productivity, in absolute terms, superior to that of the best control in 13 of the 26 experiments, this results being observed in seven of the 19 in the spring season and in six of the seven, in the summer season. This last result reveals a trend that can be translated as a greater adaptation to summer crops, in Rio Grande do Sul that are established in the months of January and February. In terms of yield potential, in a Sobradinho experiment, in the 2010/11 season, presented 3,617 kg.ha⁻¹, the highest yield observed in all experiments, attesting to its high potential. In the summer season, its highest observed productivity was 2,760 kg⁻¹, also the highest observed in this growing season in all experiments. So, TB 02-20, from the behavior observed, has a great potential as an outstanding genotype for cultivation in Rio Grande do Sul State and, probably, in other environments.

CONCLUSIONS

TB 02-20, due to its high Fe and Zn performance, as well as seed yield, has a great potential for adoption by common bean farmers in South Brazil.