ADAPTABILITY AND STABILITY OF ELITE LINEAGES AND COMMON BEAN CULTIVARS OF SPECIAL GRAINS IN DIFFERENT SEASONS OF CULTIVATION IN MINAS GERAIS, BRAZIL

O.G. Brito[1], A.J. de Carvalho[2], V.B. de Souza[3], M.B. de Oliveira[2], T.L.P.O. Souza[4], J.E. de S. Carneiro[5], J.A.A. Moreira[5], M. Martins[7], L.C. Melo[4], L.C. Faria[4], H.S. Pereira[4], J.C. Medeiros[2], M.L. Lacerda[2], A.A. de Souza[2], J.V.S. Guerra[2]

[1]Universidade Federal dos Vales do Jequitinhonha e Mucuri, [2]Universidade Estadual de Montes Claros, [3]Universidade Estadual de Maringá, [4]Embrapa Arroz e Feijão, [5]Universidade Federal de Viçosa, [6]Embrapa Milho e Sorgo, [7]Universidade Federal de Uberlândia.
Corresponding author: vanetbatista@yahoo.com.br

INTRODUCTION: The special beans comprise beans of Andean and Mesoamerican origin and present varied colors, sizes and shapes. In Brazil the beans Mesoamerican are more consumed especially the type Carioca and Black. The Andean beans produced in Brazil meet a growing demand for beans for export, with type of large and shiny grains favorite in the international market. Common bean is cultivated under different edaphoclimatic conditions, such as different seasons and planting systems, and this crop variation directly affects the selection processes of lineages in breeding programs. Cultivars with predictable behavior that best respond to environmental variations can be identified from the adaptability / stability analysis, both in specific and broad conditions (Cruz & Regazzi, 2003). This work aimed to identify elite lineages and cultivars of special grains with better agronomic performance, adaptability and productivity stability at different growing seasons in the state of Minas Gerais, Brazil.

MATERIAL AND METHODS: The experiments were carried out in the cities of Sete Lagoas, Uberlândia, Janaúba and Jaíba, in the seasons of spring-summer (october-november), summer-fall (february-march) and fall-winter (april-june) seasons (VIEIRA et al., 2006) between the years of 2010 and 2013. Twelve lineages and four cultivars were evaluated in nine environments (place / season / year combinations), four in the fall-winter season, three in the summer-fall and two in the spring-summer. The grain productivity data were submitted to the analysis of variance for each growing season and, when significant, the averages of the lineages and cultivars were compared by the Scott-Knott group method at 5% significance. The analysis of adaptability and stability of lineage productivity was performed by the method of Annicchiarico (1992), which is based on the recommendation index of the genotype (ω_i), estimated by the equation $\omega i = \mu i - z_{(1-\alpha)} \sigma_{zi}$, where: μ_i is the average of genotype i (%); σ_{zi} is the standard deviation of the Z_{ij} values associated with the i-th genotype; $z_{(1\ \alpha)}$ is the percentile of the standard normal distribution function. The coefficient of confidence adopted was 75%, that is, $\alpha = 0.25$. Adaptable / stable genotypes present ωi higher than 100%. For the analysis, the GENES program was used (CRUZ, 2013).

RESULTS AND DISCUSSION: Considering the recommendation index of the genotype (ω_i) and the lineages productivity (Table 1), it was observed that in the winter season the best adaptability and stability were CNFRx 15275 (115.39%), Jalo EEP (115.35%) and PT-68 (107.60%) and BRS Radiante (103.38%). In the water season, the best performance lineages were VR-18 (157.03%), CNFRx 15275 (151.06%), BRS Vereda (149.67%), VR-16 (123.71%) and BRS Timbo (114.43%). For the dry season, RC2RAD-155 (11.05%), VR-18 (107.76%), CNFRx 15275 (107.09%), BRS Vereda (120.86%) and BRS Radiante (113.62%) stood out. The lineage CNFRx 15275 showed high productivity, adaptability and stability in all growing seasons.

TABLE 1. Grain productivity and adaptability and stability parameters estimates for elite lineages and common bean cultivars of especial grains classes in the three growing seasons in Minas Gerais, Brazil.

GENOTYPE	Class**	Productivity (kg ha^{-1})			Annicchiarico					
		Spring-Summer	Summer-Fall	Fall-winter	ω_i [2] Spring-Summer	C [3]	ω_i Summer-Fall	C	ω_i Fall-winter	C
CNFR × 15275	Rx	2600 Aa [1]	1682 Ba	1665 Ba	115.39	1	151.06	2	107.09	5
JALO EEP	M.J	2506 Aa	849 Bb	1285 Ba	115.35	2	86.94	7	72.96	14
PT-68	Rs	2288 Aa	903 Bb	1236 Ba	107.60	3	67.13	11	73.15	13
BRS RADIANTE	M.R	2249 Aa	446 Bb	1660 Aa	103.38	4	33.80	16	113.62	2
RC2RAD-155	M.R	2127 Aa	868 Bb	1678 Aa	93.84	9	94.01	6	111.05	3
BRS VEREDA	Rs	2072 Aa	1384 Aa	1823 Aa	95.03	8	149.67	3	120.86	1
VR-16	Vr	2061 Aa	1291 Ba	1293 Ba	98.16	5	123.71	4	80.72	12
VR-14	Vr	2039 Aa	828 Bb	1396 Ba	95.80	7	83.45	8	89.23	9
BRS TIMBO	Rx	2024 Aa	1141 Ba	1168 Ba	96.80	6	114.43	5	68.28	15
CNFJ 15288	M.J	1995 Aa	534 Bb	1588 Aa	93.32	10	55.02	13	86.40	11
VR-18	Vr	1986 Aa	1719 Aa	1581 Aa	83.46	14	157.03	1	107.76	4
RAD/E550-284	M.R	1972 Aa	323 Bb	984 Ba	90.94	11	34.28	15	62.99	16
PT-65	Rs	1928 Aa	501 Bb	1451 Aa	89.87	12	46.41	14	95.89	7
VR-15	Vr	1860 Aa	701 Bb	1337 Aa	85.93	13	66.78	12	88.52	10
VR-17	Vr	1811 Aa	813 Bb	1448 Aa	78.62	16	81.73	9	94.15	8
OURO VER.*	Vr	1786 Aa	705 Bb	1474 Aa	81.34	15	75.35	10	97.54	6
CV (%) [4]		18.98	20.08	17.98						
Average (kg ha^{-1})		2081	918	1441						

* Red Gold; ** Commercial class (Rx: Purple / M.J: Manteigão Jalo / M.R Manteigão Rajado / Rs: Light Pink / Vr: Red); [1/]Averages followed by the same letter, uppercase and lowercase in the column, do not differ by Scott-Knott's test at 5% significance; [2/]ωi = recommendation index of the genotype; [3/]Classification; [4/]Coefficient of variation.

The behavior of the climatic factors in different harvests may have affected the behavior of the differentiated of the lineages, besides the genetic differences. High temperatures, for example, promote floral abortion, and consequently reduction of productivity (PEREIRA et al., 2014), directly affecting the parameters of adaptation and stability.

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