COOKING TIME OF BEAN MATERIALS IN MALAWI

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Introduction

In a 1992 study of 176 farming families in Dedza and Ntchisi districts in Malawi, cooking time was found to be the most important factor (80%) to consider when choosing beans for consumption. Taste was rated second (69%) in this study, flavor third (64%), and broth thickness fourth (63%). Families are most concerned about long cooking time because it results in higher firewood consumption, an increasingly scarce and expensive resource.

The B/C CRSP programme has been evaluating cooking time of breeding lines and varieties in Malawi since 1997. Previous studies have shown that cooking time varies with water composition, and tap water or borehole water that contain divalent cations result in longer cooking time than deionized water. Divalent cations such as calcium are bound by pectic substances within the middle lamellae of the bean cotyledon, forming calcium pectates that are insoluble and resist cell separation during cooking. In our cooking time studies, we use deionised water as a standard type of water so that we can compare our results to other regions and laboratories. Composition of tap (prevalent in urban and peri-urban areas) and borehole water (prevalent in rural villages) varies widely from region to region and it is therefore impossible to standardize cooking time evaluations using these types of water. This paper highlights some results of our cooking time evaluations, and a more complete paper can be viewed in the East Africa Bean Workshop Proceedings, http://eastafricacrsp.wsu.edu.

Materials and Methods

Bean vareties and breeding lines were evaluated for cooking time using a Mattson bean cooker at the Foods Laboratory at Bunda College of Agriculture from September 2000 to March 2001. Cooking time was evaluated using three types of cooking water (deionised, tap and borehole water) and 26 varieties in a completely randomized design with three replications. Fifty beans of each material were soaked overnight (16 hours) in deionised, tap, or borehole water, and 25 soaked beans were then cooked in the same type of water that was used for soaking. The data was analyzed using Anova in the MSTAT statistical package.

Results and Discussion

There were significant differences in cooking time among bean materials within the three types of cooking water (Table 1). Cooking time was fastest in deionised water (range 53-101 minutes, mean 73 minutes), second fastest in tap water (range 61-132 minutes, mean 87 minutes), and slowest in borehole water (range 88-231 minutes, mean 140 minutes). The mean increases in cooking time in tap and borehole water as compared to deionised water were 14 and 67 minutes, respectively. Only six materials had cooking time in tap water that was faster than or equal to cooking time in deionised water – AND 656, Sugar 47, DC 184-35, Fitomeko, Bwenzilaana and Sugar 59.

B/C CRSP-released varieties Kalima and 2-10 were two of the fastest cooking materials in all three types of water, whereas the Malawian crosses (3J/2, 2N/2, 15P/8 and 2G/2) were all slow cooking in borehole water. Kalima, DC 95-170 and 2-10 may be suitable for a wide variety of areas that include both hard water (high calcium and divalent cation levels) and soft water

(low calcium and divalent cation levels) because the increase in cooking time due to type of cooking water was minimal. Other bean materials such as 3J/2, IZ 226-1, DC 86-191, 15P/8, DC 86-250, Kanzama, 2G/2, Sugar 47 and ZPV 906 would be fast cooking only in areas with soft water but would be very slow cooking in areas with hard water.

Based on this information it is necessary to test the cooking time of bean breeding lines using several types of water before the line can be classified as fast cooking. Breeding lines should be evaluated so that cooking time can be taken into consideration before a line is considered for release. Differences due to type of cooking water need to be further investigated to allow breeders to determine the characteristics to select for faster cooking time.

Table 1. Cooking time (minutes) of 26 dry bean varieties and breeding lines in three types of cooking water (deionised, tap, and bore hole water) in 2001.

	Types of Soaking and Cooking Water[x]			Differences in Cooking Time		
Variety	Deionised (D)	Tap (T)	Borehole (B)	T - D	B – D	B – T
3J/2	53	83	187	30	134	104
Kalima	57	64	96	7	39	32
IZ 226-1	60	78	203	18	143	125
Sugar 59	62	62	146	0	84	84
DC 86-191	62	100	162	38	100	62
DC 86-244	62	90	147	28	85	57
2-10	63	67	88	4	25	21
15 P/8	64	98	192	34	128	94
AI 97	65	94	155	29	90	61
DC 96-95	65	79	150	14	85	71
ZPV 292	66	132	148	66	82	16
And 278	67	108	145	41	78	37
Enseleni	67	90	161	23	94	71
Bwenzilana	69	61	128	-8	59	67
DC 86-250	72	94	231	22	159	137
Fitomeko	73	67	128	-8	55	61
Kanzama	74	79	209	5	135	130
Sugar 56	76	91	145	15	69	54
2G/2	83	91	197	8	114	106
DC 184-35	86	75	102	-11	16	27
2N/2	86	93	155	7	69	62
Sugar 47	86	75	180	-11	94	105
DC 95-170	88	112	94	24	6	-18
PC 512 –B4	95	100	121	5	26	21
ZPV 906	99	114	184	15	85	70
AND 656	101	74	151	-27	50	77
Grand Mean	**73**	**87**	**140**	**14**	**67**	**53**

[x] **LSD (0.01) = 13.2**