J. Food Sci. Technol., 1996, Vol. 33, No. 3, 211-214

Evaluation of Blanching Quality in Groundnut (*Arachis hypogaea* L.)

U. SINGH*, R. SRIDHAR, S.L. DWIVEDI, S.N. NIGAM, AND R. JAMBUNATHAN

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru 502 324, India.

Thirty five Spanish and forty six Virginia groundnut genotypes, grown in the 1992 rainy season and the 1992/93 post-rainy season at the ICRISAT Asia Center, were evaluated for their blanching quality. The standardized conditions of preheating the seed samples at 200°C for 8 min, followed by blanching for 2 min at 15 psi air pressure, gave satisfactory results. There was a large variation in total blanchability within Spanish (10.8-90.6%) and Virginia (8.6-86.7%) genotypes. Results indicated that high total blanchability in genotypes were contributed largely by the blanched split seeds. Effects of growing seasons on various blanching quality parameters were more pronounced in the Virginia genotypes than in the Spanish genotypes.

Keywords : Blanching quality, Spanish and Virginia groundnut genotypes.

Groundnut, an oilseed crop, is also used in many popular food forms (Evans 1982). The salted groundnuts, candies, confectionery, roasted nuts, and butter are some of the important food uses of groundnut. The blanching process, which primarily involves the removal of skin, also called testa, is a major step in processing groundnuts for many edible end products. In addition to skin removal, blanching clears the seeds of dust, mould and other foreign materials (Woodroof 1966). It is a very important process in the manufacture of peanut butter, whole nuts, candies, and *chikkis* (a snack food comonly consumed in India). The quality of these products is adversely affected, if skins and germs are not properly removed from the cotyledons, as their presence imparts a bitter taste to groundnut butter (Willich et al. 1952). Laboratory devices have been designed and developed to measure the ease of skin (testa) removal from groundnuts (Barnes et al. 1971; Wright and Mozingo 1973; Hoover 1979).

Several factors, such as seed and skin moisture content, temperature of storage, hygroscopic and thermal properties of seed and adherence of skin to the cotyledons, affect the blanchability of groundnut (Farouk et al. 1977). Blanchability was shown to be a character, mainly related to genotype, seed size, and degree of maturity as well as the time and temperature of the post-harvest storage period (Shokraii et al. 1985). On the basis of electrophoresis of seed proteins, it was observed that a 36 kilo dalton protein, a major polypeptide, was associated with the poor blanchability in groundnut (Shokraii et al. 1985). These workers further suggested that this character could be used as a reliable indicator of blanchability in groundnut cultivars and breeding lines.

The blanching quality is an important consideration in the evaluation and testing of groundnut breeding lines developed for food uses. This paper presents the results on standardization of operating conditions of a locally fabricated laboratory blancher and on variation in blanching quality of newly developed Spanish and Virginia genotypes of groundnut.

Materials and Methods

Seed samples of advanced breeding lines of 35 Spanish and 46 Virginia goundnut genotypes were used in this study. These genotypes including two Spanish control cultivars "(JL 24" and "ICGS 11") and three input conditions (60 kg P_2O_5, irrigated, 400 kg ha^{-1} gypsum at flowering and protection against diseases and insect pests) in the 1992 rainy and the 1992-93 post-rainy seasons at ICRISAT Asia Center, Patancheru, Andhra Pradesh, India. After harvest, pods were cured, dried and shelled seeds were stored at room temperature (20±1°C) until blanching. Two determinations (replications) were made for blanching quality parameters on each genotype.

Blanching operation: A laboratory type blancher (Fig. 1) was fabricated at the ICRISAT Asia Center, based on the model developed and described by Wright and Mozingo (1973). It consists of an inclined-screen container that rotates inside an acrylic plastic cylinder. An air-steam is directed through the bottom of the rotating screen container, which loosens the skins from the groundnuts, as they move in a swirling fashion. A vaccum-cleaner connected to the plastic cylinder removes the loose

* *Corresponding Author*

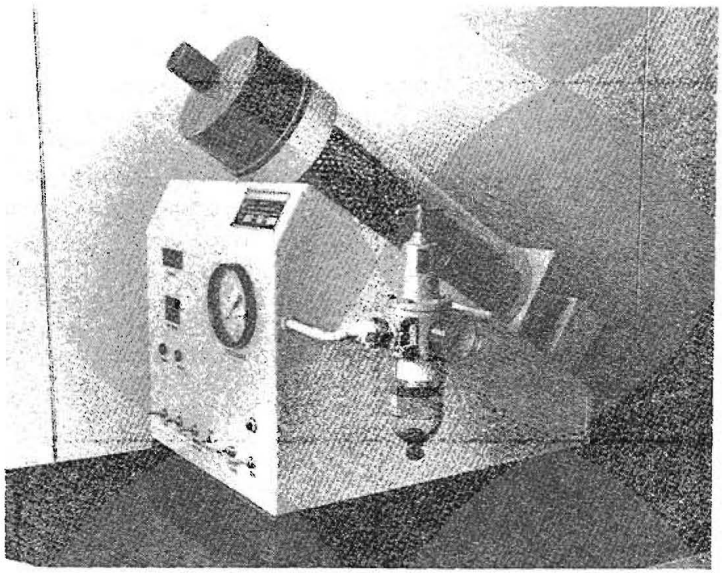

Fig.1. A laboratory device fabricated for evaluating groundnut blanching quality at ICRISAT Asia center.

skins. Samples, weighing about 250 g, are preheated and transferred into the screen-container for blanching tests. Because of the availability of large quantity of seed material, a Virginia genotype, 'ICGV 86347' was used to standardize the blanching conditions, such as optimum time for blanching, preheating temperature, and air pressure. Samples were tested at various pressures, ranging between 10 and 20 psi. To study the optimum duration of blanching, the blanching time settings were increased by 30 sec increments from 90 to 210 sec. To measure the effect of preheating temperatures on blanchability, the blanching time and air pressure were held constant at 120 sec and 16 psi, respectively and the preheating temperature was increased from 160 to 210°C in 10°C increments. Sample weights were recorded to determine the percentage of blanched whole seed (BWS), blanched split seed (BSS) and unblanched seed (UBS). Blanching loss (BLS) was estimated on the basis at weight of skin, germ and brokens. Standard error and means for the treatment were estimated, assuming one way analysis of variance (Snedecor and Cochran 1967).

Results and Discussion

The air pressure in the blancher played an important role in determining the blanching quality of groundnuts. With an increase in the air pressure, the percentage of unblanched seed decreased and the percentage of blanched split seed increased. The percentage of blanched whole seed also increased with an increase in the air pressure up to 15 psi and then it showed a decline, as a result of higher

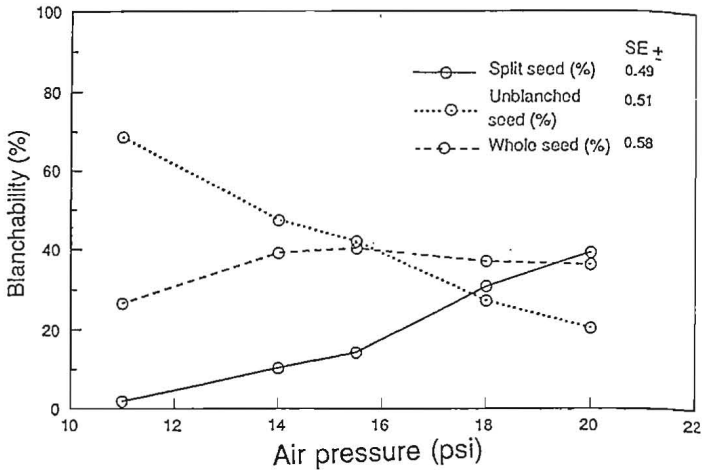

Fig. 2. Effect of air pressure on blanching quality of groundnut genotype 'ICGV 86347'

proportion of blanched split seed (Fig. 2). The duration of blanching also influenced the blanchability. As the blanching time increased from 90 to 210 sec, the percentage of unblanched seed decreased from 36 to 17%, but the percentage of blanched split seed increased rapidly from 120 sec onwards. The percentage of unblanched seed decreased with the increase in preheating temperature, the decline being sharp after 190°C.

The percentage of blanched whole seed remained fairly stable across the temperature range studied. The percentage of blanched split seed increased rapidly after 190°C. The results of the present study are similar to the findings of earlier workers, who have also reported that the satisfactory laboratory blanching tests could be made by operating the blanching device for 120 sec at 17.6 psi (Barne et al. 1971). Based on the results of present study, it is suggested that the operating conditions for the laboratory blanching device should include preheating the samples at 200°C for 8 min, followed by blanching for 2 min at 15 psi air pressure.

Results of the variablities in blanching quality parameters of 81 genotypes, comprising Spanish and Virginia types, are presented in Table 1. The range of total blanchability in Spanish (10.8-90.6) and Virginia (8.6-86.7%). genotypes was almost similar in both the seasons. The growing season environment influences the blanching quality of groundnut genotypes (Farouk et al. 1977; Mozingo 1979). This influence on total blanchability was pronounced in the present study with the post-rainy season crop giving lower mean values. The proportion of blanched whole seed was only marginally influenced, but the proportion of

TABLE 1. BLANCHING QUALITY OF SPANISH AND VIRGINIA GENOTYPES GROWN IN THE 1992 RAINY AND THE 1992/93 POST-RAINY SEASONS AT ICRISAT ASIA REGION

Season	TBS, %		BWS, %		BSS, %		UBS, %		BLS, %		100-seed mass, g	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range
						Spanish						
						(n=35 genotypes)						
Rainy	68.3	29.8-90.6	39.7	9.3-62.2	28.6	3.4-81.1	27.3	0.9-66.3	4.6	2.8-8.7	54.3	34.7-73.3
Post-rainy	50.8	10.8-85.7	39.6	9.9-65.4	11.1	0.4-37.2	45.8	9.8-86.7	3.5	1.8-5.4	84.3	54.2-125.2
SE	±3.21		±2.26		±2.59		±3.35		±0.19		±2.41	
						Virginia						
						(n=46 genotypes)						
Rainy	59.5	24.7-86.7	38.7	11.5-55.3	20.8	4.2-59.8	36.3	6.6-73.2	4.2	1.5-7.0	61.8	43.9-76.4
Post-rainy	42.6	8.6-83.3	34.1	6.8-67.4	9.0	0.7-61.4	53.3	10.1-89.2	3.5	2.1-10.0	92.1	66.5-118.6
SE	±2.60		±2.04		±1.87		±2.79		±0.20		±1.81	

TBS=Total blanched seed; BWS=Blanched whole seed; BSS=Blanched split seed; UBS=Unblanched seed; BLS=Blanching loss (See text for formula).

blanched split seed declined markedly giving rise to a higher proportion of the unblanched seeds in the post- rainy season. The 100-seed mass in the post rainy season was also higher than that of the rainy season. Blanching losses in these genotypes ranged between 1.5 and 8.7% in the 1992 rainy season and between 1.8 and 10.0% in the 1992/93 post- rainy season. Parker (1987) had observed that blanching resulted in a weight loss of 3.0-3.5%, depending on the groundnut cultivars.

The genotypes having total blanchability of 70% or above are considered to be good for end use food quality (Shokraii et al. 1985). On the basis of this criterion, several Spanish and Virginia genotypes, which had total blanchability exceeding 70% in both rainy-post rainy season could be identified (Table 2). Some of these genotypes, which have high split seed blanchability could be more suitable for candies and butter preparation. A high percentage of blanched splits is preferred for these end uses, as it permits easy removal of germs and hence reduces aflatoxin contamination (Diener et al. 1982). Except for the blanching loss, the association of blanching quality parameters between rainy and post-rainy seasons in Virginia genotypes was non-significant (Table 3). In the case of

TABLE 2. 100-SEED MASS AND BLANCHING QUALITY OF SOME SPANISH AND VIRGINIA GENOTYPES GROWN IN THE 1992 RAINY SEASON AND THE 1992/93 POST-RAINY SEASON

Group	Genotype	1992 Rainy season				1992/93 Post-rainy season			
		100-seed mass g	TBS, %	BWS, %	BSS, %	100-seed mass g	TBS, %	BWS, %	BSS, %
Spanish	'ICGV 88487'	56.7	75.7	40.8	34.9	73.7	83.8	54.7	29.1
	'ICGV 88490'	55.8	79.7	43.7	36.0	69.0	75.4	41.0	34.4
	'ICGV 90320'	45.1	90.4	9.3	81.1	65.4	72.4	35.2	37.2
	'ICGV 91096'	58.2	84.7	45.3	39.4	75.5	82.8	53.2	29.6
	'JL 24'	39.7	88.5	18.5	70.0	58.0	85.7	58.8	26.9
	'ICGS 11'	37.8	80.4	37.8	42.6	60.1	65.7	50.7	15.0
	SE (n=6)	±1.47	±2.13	±1.84	±2.52	±1.93	±2.06	±2.54	±1.78
Virginia	'ICGC 90182'	56.5	76.8	27.3	49.5	82.2	67.2	33.5	33.7
	'ICGV 90281'	47.9	72.1	27.1	45.0	74.5	85.3	63.9	21.4
	'ICGV 90307'	58.7	74.6	30.4	44.2	78.6	74.9	63.4	11.5
	'ICGV 90321'	51.0	74.1	22.7	51.4	80.1	79.9	18.5	61.4
	'ICGV 91080'	76.4	71.2	55.3	15.9	100.0	74.6	67.4	7.2
	'ICGS 76'	48.9	40.9	31.2	9.7	70.6	24.7	22.3	2.4
	'Chandra'	50.3	57.4	36.8	20.6	80.3	53.1	39.4	13.7
	'Chalimbana'	67.3	45.8	33.6	12.2	94.4	18.4	15.2	3.2
	SE (n=8)	±1.45	±2.16	±1.93	±1.83	±2.65	±2.12	±1.76	±1.63

BWS=Blanched whole seed; BSS=Blanched split seed; TBS=Total blanched seed.

TABLE 3. RELATION BETWEEN BLANCHING QUALITY PARAMETERS OVER RAINY SEASON AND THE POST-RAINY SEASON AT ICRISAT ASIA REGION.

Character	Correlation (r)	
	Spanish (n=35)	Virginia (n=46)
100-seed mass, g	0.583**	0.325*
Total blanchability, %	0.679**	0.219
Blanched whole seed, %	0.261	0.226
Blanched split seed, %	0.696**	0.168
Unblanched seed. %	0.672**	0.224
Blanched loss, %	0.373*	0.362*

n = number of genotypes

* Significant at 0.05%, level

** Significant at 0.01% level

Spanish genotypes, these associations, except for blanched whole seed, were significant. This indicated that the influence of growing environment on blanching quality parameters was more pronounced in Virginia types than that of Spanish genotypes. The results of this study suggest that blanching quality parameters could be consistent across seasons for Spanish types and not for Virginia types, implying that selection for blanching quality paarameters could be done irrespective of season for Spanish and probably not for Virginia types. Further, it is emphasized that blanching quality is an important characteristic and remarkable genotypic differences exist in this trait. Efforts should be made to develop genotypes with improved blanching quality, keeping in mind the end uses of groundnut.

Acknowledgement

Authors thank M.C. Sekhar for technical assistance and the Staff of Research and Development, Farm and Engineering Services Program, ICRISAT, for fabricating the blanching device.

References

Barnes Jr PC, Holaday CE, Pearson JL (1971) Device to measure ease of skin removal from peanuts. J Food Sci 36:405

Diener UL, Pettit RE, Cole RJ (1982) Aflatoxin and other mycotoxins in peanuts. In: Pattee HE, Young CT (eds) Peanut Science and Technology American Peanut Research and Education Society, Inc, Yoakem, Texas, USA

Evans ER (1982) Confectionery products from peanuts. Cereal Foods World, December, pp 593-586

Farouk SM, Brusewitz GH, Paulsen MR (1977) Blanching of peanut kernels as affected by repeated rewetting-drying cycles. Peanut Sci 4:63-66

Hoover MW (1979) A rotary air impact peanut blancher. Peanut Sci 6:84-87

Mozingo RW (1979) Factors affecting blanchability in peanuts. Proc Am Peanut Res Educ Assoc 11:9-14

Parker WA (1987) Peanut blanching-processing, utilization and effects on quality and product shelf life. In: Ahmed EM, Pattee ME (eds). Peanut Quality-Its Assurance and Maintenance from the Farm to End-products, Bulletin No. 874, University of Florida, Gainesville, USA

Shokraii EH, Esen A, Mozingo RW (1985) Relation of a 36000-dalton arachin subject to blanchability in peanuts. J Agric Food Chem 33:1114-1116

Snedecor GW, Cochran WG (1967). One Way-Classification Analysis of Variance in Statistical Methods, 6th edn., Academic Press, New York, USA

Willich RK, Hall AS, Morris NJ, Freeman AF (1952) Peanut butter I. Roasting, cooling, blanching and picking of peanuts. Food Technol 6:71-75

Woodroof JG (1966) Peanuts: Production, Processing, Products, AVI Publishing Co., Inc, Westport, Conn, USA

Wright FS, Mozingo RS (1973) Laboratory device for peanut skin removal, Penut Sci 1:11-15

Received 27 February 1995; revised 15 February 1996; accepted 15 June 1996