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Occurrence and Quality of Florunner Peanuts with Purple Testa Discoloration

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ABSTRACT

Occurrence and quality of Florunner peanuts with purple testae from combined Federal-State check grade samples were examined. The number of purple peanuts varied inversely with seed size, with up to 6.7% weight in the commercial grade size "other edible." Exposure of viable peanut pods to light affected the development of purple testae. The percentage of No. 1 grade size peanuts with purple testae increased from 0.86 to 8.53 when pods on growing plants were exposed to direct sunlight. Misting freshly harvested peanuts for 10 days in the windrow also increased the occurrence of purple testae. Except for oil color, only slight differences were found in objective quality determinations between purple testae and normal (no purple testae) peanuts of the same size. Peanut butter from normal peanuts was judged better flavored than that from purple testae peanuts but no difference was detected between normal and a sample containing 7.5% purple, although purple testae peanuts increased the tendency toward grayness of the peanut butter. These data indicate the need for reevaluation of the "damage" designation of peanuts with purple testae.

Key Words: Peanuts, Quality, Purple Testae Discoloration, Peanut Grading.

In the grading procedure for farmer stock peanuts, seed with dark purple testae discolorations which cover more than 25% of the seed surface are classified as damaged (6). Other type defects are also classified as damaged seed and, if the percent of damage in a lot of peanuts is more than 1.5%, value of the lot is reduced according to an escalating scale. Some seed are obviously damaged, moldy, or otherwise unacceptable, but inclusion of seed in the damaged category which are not potentially deleterious to quality may serve only to raise the percentage beyond an acceptable level and decrease value. This study was initiated to determine if peanuts with purple testae discolorations were actually of inferior quality and correctly classified as damaged. Inherent in this work was some estimation of occurrence of purple discoloration which led to further examination of factors which influenced its occurrence. Observation of growing plants indicated that light might be a significant contributing factor; therefore, light exposure treatments were imposed on viable peanut pods of plants in the field and windrowed plants maintained with a water mist.

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Materials and Methods

Florunner peanuts used for quality determinations were obtained from composite, 1979 crop, Federal-State Inspection Service check grade samples or from three combined 1980 crop year samples from a commercial shelling plant. Grade samples were shelled, sized, and hand-picked to obtain seed with obvious purple discoloration. Purple seed from the commercial peanuts were hand-picked from the other edible (OE) size category (screen size - 5.55 mm x 19.05 mm, 6.75 mm round [14S/64, 17R/64]).

Total oil percentages were determined by a method similar to AOCS Method Ab 3-49 (1) except that the ground seed were placed in thimbles in Soxhlet equipment for oil extraction. Oil for quality evaluations was expressed with a Carver Laboratory press maintained at ca. 8.2×10^3 kg for 1 hr. Free fatty acids in the pressed oil were determined by the titration procedure of AOCS, Method Aa 6-38 (1). Oil color and iodine value were determined by APREA Methods B-2, Maturity and B-3, Iodine Value, respectively (2). Fatty acid profiles were determined by GLC as previously described (5). Oil stability was determined by the method of Young and Holley (7). For flavor analysis peanuts were dried to 5% moisture content, roasted 19 min at 177 C, blanched, ground, and evaluated as previously described (3). Reflected colors of raw (skins intact) and roasted-blanched nuts and of peanut butter were determined with a HunterLab Model D25D2L Color/Difference Meter. Three samples were subjected to various quality evaluations: 1) normal (no purple testae), 2) purple testae (hand-picked, all with some purple discoloration), and 3) 7.5% purple testae (normal and purple testae peanuts mixed to obtain 7.5% purple testae by weight).

In 1980, pods of field plants in ca. 10 m of row were exposed by removing soil from around the attached pods without uprooting the plants. After 21 days the exposed plants and corresponding unexposed control plants were hand-dug, windrowed for 3 days, and mechanically picked. Peanuts were shelled, sized, and hand-sorted to determine the percentage of seed with purple discolored testae. Peanut plants (ca. 10 m of row) from the same field in 1980 were hand-dug, inverted in windrows, and misted for 10 days under translucent fiberglass roofs. Mist was applied 1 min in every 5 min with 0.508 mm orifice misters (252 ml/min) set 0.75 m apart. After treatment, the plants were dried 3 days before picking. Control plants were placed under similar fiberglass roofs but were not misted.

Results and Discussion

To estimate the occurrence of peanuts with purple testae (seed with some obvious purple discoloration), a peanut drying trailer load (ca. 4.5×10^3 kg) of composite

Federal-State check grade samples was randomly sampled to obtain ca. 23 kg of inshell peanuts. Check grade samples are derived from the unused portion of peanuts pneumatically sampled from trucks and trailers at peanut buying points. All of the peanuts in the lot were grown in south central Georgia. Table 1 gives the weight percentages of seed with purple discolorations found in each size category. A greater percent of seed with purple discolorations was found in the smaller size categories. This distribution is probably related to a size-maturity relationship in which immature seed which are exposed to factors influencing purple testae do not develop to larger sizes. The percent weight of purple seed in those seed riding a 6.35 mm x 19.05 mm slotted screen (those evaluated in the grading of farmer stock peanuts) in the sample was 0.91. This percentage in itself would not cause a value deduction; however, if sufficient other damage was present to result in a total of 1.5 to 2.49%, a $3.40/T deduction would be applied. Information from these samples demonstrated that purple seed were present in sufficient quantity to have a high potential for affecting the overall damage percentage of farmer stock peanuts.

Table 1. Peanuts with purple testae discoloration in Federal-State check grade samples, Georgia - 1980.

Seed size (screen size)	Content
	% weight
Jumbo 8.33 mm (21/64 in.)	0.06
Medium 7.14 mm (18/64 in.)	0.54
#1 6.35 mm (16/64 in.)	2.98
Other edible 5.55 mm, 6.75 mm round (14S/64, 17R/64 in.)	6.73
Oil Stock 5.55 mm (<14/64 in.)	10.19

One factor which seems to affect the percentage of purple seed is exposure of viable pods to light. Even casual observation of growing peanut plants indicates that peanut pods with green exterior coloration normally contain seed with purple testae discoloration. Development of green coloration in normally nonphotosynthetic tissue is often related to development of chlorophyll in response to light. The data in Table 2 demonstrate that removal of growing peanut pods from the soil results in substantial increases in the percentage of purple seed. While the 21-day exposure time may not be critical to formation of purple testae, it does indicate that either early or late season cultural practices which may expose peanut pods have the potential for increasing the percentage of seed with purple testae. Percentages for the various seed sizes in Table 2 are similar to those found in the Federal-State check grade samples (Table 1) and since a size-maturity relationship generally exists, seed that have attained a certain maturity level probably are not affected by exposure.

In 1979, windrowed peanuts in many fields were subjected to several days of rain and at least one peanut sheller noted an increase in peanuts with purple testae. In our tests, when windrowed peanuts were subjected to a fine mist under translucent fiberglass roofs, the percentage of purple seed increased substantially (Table 2). Although plant roots were exposed under these conditions, plants remained green and relatively turgid during the 10 days of mist treatment. It is likely that one or two days of good drying conditions before misting began would have reduced the effect of the treatment since physiological processes of even the small, very moist pods would have been greatly altered by drying. In both cases, field-exposed and windrowed peanuts were exposed to air and light while the plants were maintained and the number of seed with purple testae increased.

Table 2. Increase of purple testae discoloration by exposure of peanut pods in the field and misted windrows.

Seed size	Control	Exposed [a]	Control [b]	Misted [c]
		% Weight		
Jumbo	-	-	0.44	0.88
Medium	0.64	0.98	0.34	2.28
#1	0.86	6.59	2.54	8.32
Oil stock	5.00	23.44	9.42	18.81

[a] Soil removed from attached peanuts 21 days before digging.

[b] Windrowed peanuts dried under translucent fiberglass roofs.

[c] Windrowed peanuts misted 10 days then dried under translucent fiberglass roofs.

Quality parameters of oil from normal and purple seed are presented in Tables 3 and 4. Percent oil increased significantly (DNMR, 5%) as seed size increased, a maturational effect (4), for both purple and normal seed. The differences between normal and purple were small, the largest being 1.8% in the OE size. Oil color was consistently different for normal and purple seed in all size categories. A dark stain often left on the cotyledons of purple seed after the testa is removed may account for some of the difference. Iodine values, free fatty acid values, and oven stability for normal and purple seed were not significantly different for any size and indicate that purple testae do not diminish product storability potential. Fatty acid profiles of oil from normal and purple seed indicated some consistent, though probably inconsequential, differences (Table 4).

Table 3. Quality parameters of peanuts with normal (N) and purple (P) testae.

Seed size		% Oil	Color	IV	FFA %	Oven stability days
Medium	N	51.8	0.057**	94.2	0.40	25.0
	P	51.8	0.161	93.5	0.53	25.0
#1	N	49.2*	0.104**	95.0	0.43	24.0
	P	50.3	0.226	93.8	0.40	23.7
OE	N	45.6*	0.135**	94.4	0.60	22.0
	P	47.4	0.332	92.4	0.56	22.3
OS	N	41.3	0.437**	93.9	1.20	17.0
	P	41.7	0.850	93.2	0.67	17.0

All data are the means of 3 separate analyses of Federal-State check grade samples.

*,** N and P are significantly different at 5% and 1% level of probability, respectively.

The count per ounce and blanchability data (Table 5) of OE size from a commercial shelling plant show that purple seed were significantly smaller than the normal seed, but that blanchability after roasting was the same.

Color (brightness) of normal, purple, and 7.5% purple

Table 4. Fatty acid profiles of oil from sized peanuts with normal (N) and purple (P) testae.

Seed size		16:0	18:0	18:1	18:2	20:0	20:1	22:0	24:0
					Mole %				
Medium	N	12.0	2.3	51.2	28.8	1.2	1.2	2.2	1.0
	P	11.5	2.6	51.2	28.4	1.3	1.3	2.5	1.2
#1	N	12.3	2.3	48.9	30.3	1.2	1.3	2.5	1.2
	P	11.6	2.7	50.4	28.5	1.4	1.4	2.7	1.3
OE	N	12.5	2.3	47.5	30.9	1.3	1.4	2.8	1.4
	P	11.5	2.7	49.5	28.7	1.5	1.5	3.1	1.4
OS	N	13.2	2.1	45.2	31.8	1.2	1.8	3.4	1.5
	P	12.2	2.4	46.8	30.0	1.5	1.9	3.7	1.6

All data are the mean of 3 separate analyses of Federal-State check grade samples.

Table 5. Physical characteristics of other edible size peanuts with normal and purple testae.

	Count per oz.	Blanchability %
Normal	106*	77.8
Purple	120	84.0

*Significantly different at 5% level of probability.

seed in the raw, roasted-blanched, and butter states is presented in Table 6. The content of purple seed in the OE category of Federal-State check grade samples was 6.7% (Table 1); therefore, a slightly higher percentage, 7.5%, was selected for evaluation. Raw, normal and purple seed were obviously different, and inclusion of 7.5% purple seed in the normal seed decreased color brightness slightly. The effect of purple testae on brightness became less obvious as roasting and blanching were accomplished. The aL color values of peanut butters were significantly less in 7.5% purple and purple indicating a tendency toward grayness (Table 6). These differences may be of practical significance since OE size category is often used in the manufacture of peanut butter. However, since this size is normally mixed with larger seed sizes to make peanut butter, the effect of peanuts that had purple testae before blanching would be greatly diminished. Flavor ratings indicate no difference in flavor of butter from normal and 7.5% purple testa seed, although purple testa seed alone had a significantly less desirable flavor (Table 6). Further tests are necessary to define the level of purple seed that will significantly affect flavor; however, the data show that commonly encountered percentages of purple testa peanuts are of little consequence as a cause of off-flavor in peanut butter.

Table 6. Color and flavor ratings of normal, purple, and 7.5% purple peanuts.

	Color values				Flavor Rating*
	Raw	Roasted/blanched	Butter		Butter
	L	L	L	aL	
Normal	38.8 A	53.9 A	50.3 A	9.5 A	2.74 B
Purple	28.5 C	51.8 A	50.9 A	7.1 C	3.40 A
7.5% P.	37.0 B	53.7 A	50.9 A	8.9 B	2.45 B

Other edible size category used exclusively.

L = brightness

aL = (green [-]-0-red [+]) apparent grayness increases near 0

*Scoring based upon a five-point hedonic scale. The smaller the number the better the flavor.

Means in a column followed by unlike letters are significantly different at the 2.5% level of probability.

The data in this study indicate that commonly occurring quantities of peanuts with purple testae have the potential to affect only those quality factors related to color. The practical implications and significance of these effects require further study; however, the apparent conclusion is that reevaluation of certain aspects of peanut grading procedures is needed to eliminate the potential for unwarranted lot value reduction.

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