Peanut Storage Studies: Effect of Storage Moisture on Three Varieties of Runner Peanuts

NORMAN D. DAVIS, Botany and Plant Pathology Department, Auburn University, Auburn, Alabama

Unshelled Dixie Runner, Early Runner, and Virginia Runner G-26 peanuts were stored 3½ months at moisture contents ranging from 4.8 to 11.2% kernel dry weight. Seed were analyzed quantitatively for various components. Initial composition was determined for each variety. Changes during storage were qualitatively the same for the three varieties but quantitatively different for some components. Oil content, iodine value, tocopherols, total and protein nitrogen, and total sugar content were not influenced by storage moisture. Carbonyl compounds, free fatty acids, and peroxide values varied directly as storage moisture. Early Runner and Virginia Runner G-26 appeared less susceptible to the development of oxidative and hydrolytic rancidity than Dixie Runner. However, the degree of difference was slight and occurred only at higher storage moistures. Initial composition of the three varieties differed slightly. Early Runner had a slightly greater initial oil percentage and lower total sugar content than either Dixie or Virginia G-26. Virginia Runner G-26 had a slightly lower total nitrogen percentage than either of the other two varieties.

The moisture content of stored peanuts must generally be low if seed quality is to remain high. An investigation of chemical changes occurring in Dixie, Early, and Virginia G-26 varieties of runner peanuts was carried out to determine, and compare, the effect of storage moisture on chemical composition of the seed. Dixie variety has been grown extensively in Alabama. Early and Virginia G-26 are comparatively new varieties which are presently being recommended (6). Chemical analysis of the latter variety has not previously been reported.

Materials and Methods

Dixie, Early, and Virginia G-26 runner peanuts were grown at the Wiregrass Substation, Headland, Alabama, harvested and cured to a kernel moisture of 7 to 8% on an oven dry weight basis. Unshelled peanuts were stored 3½ months in humidity cabinets maintained at various relative humidities by the saturated salt solution method used by Karon and Hillery (4) and Thompson *et al.* (9). Peanuts were in single layers on shelves above saturated salt solutions (Table 1), which maintained relative humidities of 53 to 92% depending on the salt used. A small fan operated continuously for 4 hrs. each day, helped maintain equilibrium conditions in each cabinet. Storage was at 25°C. The relationship of salt solution to relative humidity and seed moisture is given in Table I. Each analysis was replicated 3 times and results averaged. Total oil was determined by AOCS method Ab 3-49, (1), free fatty acids by AOCS method 5-49, and iodine value by AOCS method Cd 1–25. Analyses of nitrogen fractions were by the Kirk Micro Kjeldahl method (5), peroxides by the Wheeler method as modified by Moore and Bickford (7), carbonyls by the Henick method (2), tocopherols by the method of Hove and Hove (3), and total sugars by the method of Pelczar *et al.* (8).

Prior to analyses the peanuts were shelled, dried to constant weight (130°C. for approximately 1 hour) in a forced-air oven, and ground to a fine consistency with a Universal No. 71 food grinder. Analyses of the oil were made immediately following preparation of the samples. Samples were stored at 0°C. in screw-capped bottles and the remaining analyses made shortly thereafter.

Results and Discussion

Initial oil content averaged 47.6% kernel dry weight in Dixie, 52.5% in Early and 48.6% in Virginia G-26. Oil percentage was not influenced by storage moisture. The Dixie variety appeared to be more susceptible to the development of oxidative rancidity than either of the other two varieties. Carbonyl content of Dixie increased directly as storage moisture from 0.52 mM/kg. of oil at 4.8% moisture to 1.00 mM/kg. of oil at 10.6% moisture. Carbonyl content of Early Runner and G-26 were not greatly influenced by storage moisture. Initial peroxide value was 1.5 for Dixie and 1.00 for Early and G-26. Peroxide values increased abruptly at the highest storage moisture to approximately double the initial value for each variety. Free fatty acids, as percentage of total fatty acids, varied directly with storage moisture in each variety, an indication of developing hydrolytic rancidity. The moisture content at which free fatty acids began to increase was not the same for each variety. Dixie was the most sensitive in this respect and G-26 the least sensitive. Dixie increased in percentage free fatty acids from 0.22 at 5.4% moisture to 1.47 at 10.6% moisture. Early increased from 0.22 at 8% moisture to 7.6 at 10% moisture. G-26 had the highest initial value but was influenced the least by the storage moisture, increasing abruptly from an initial 0.4 to 9.15 when stored at 11.2% moisture. No increase was apparent at lower moistures.

TABLE I

Per Cent Moisture of Unshelled Peanuts Held 3½ Months at Different Relative Humidities Over Saturated Salt Solutions (Initial Moisture 7 to 8 Per Cent)

Saturated salt solution	Relative humidity %	Kernel moisture %
Ammonium dihydrogen phosphate	92	10.0–11.2
Potassium chromate	86	7.7– 8.7
Sodium chloride	75	6.7– 8.0
Sodium nitrite	65	5.4– 6.6
Sodium dichromate dihydrate	53	4.8– 5.1

Iodine value, tocopherols, total and protein nitrogen, and total sugars were not appreciably influenced by storage moisture.

Initial componsition of the three varieties differed somewhat. The Early variety was comparatively high in oil percentage, low in iodine value, and low in total sugars. Virginia G-26 was comparatively low in total nitrogen, and high in tocopherols, and total sugars. The high tocopherol and low total nitrogen in the

TABLE II

Effect of Storage Moisture on Chemical Composition of Dixie Runner, Early Runner, and Virginia Runner G-26 Peanut Kernels

Storage time	Kernel moisture % dry wt.	Oil content % dry wt.	Peroxide value	Carbonyl compounds mM/kg.-oil	F.F.A. as % T.F.A.	Iodine value	Tocopherols mg./g.	Total nitrogen % kernel dry wt.	Protein nitrogen % kernel dry wt.	Total sugars mg./g.
Dixie Runner										
None	7.0	47.6	1.5	0.45	0.22	91.2	0.10	4.4	3.8	27.5
3½ months	4.8	47.7	1.5	0.52	0.22	91.7	0.10	4.4	3.8	27.5
3½ months	5.4	47.7	2.0	0.55	0.22	91.5	0.10	4.4	3.7	27.4
3½ months	6.7	47.4	2.2	0.72	0.25	92.0	0.09	4.2	3.7	28.4
3½ months	7.7	47.9	2.0	0.92	0.40	91.7	0.12	4.4	3.8	28.0
3½ months	10.6*	47.9	4.2	1.00	1.47	91.6	0.17	3.9	3.8	26.4
Early Runner										
None	7.6	52.5	1.0	0.65	0.22	90.7	0.12	4.3	3.8	23.3
3½ months	5.1	52.6	2.5	0.54	0.22	91.0	0.12	4.2	3.8	23.3
3½ months	6.4	52.1	2.5	0.49	0.22	91.5	0.13	4.3	4.0	23.0
3½ months	8.0	52.5	2.3	0.65	0.22	91.0	0.12	4.2	3.7	23.2
3½ months	8.7	52.4	2.5	0.44	0.47	91.0	0.10	4.3	3.9	22.7
3½ months	10.0*	51.3	5.2	0.56	7.60	91.5	0.13	4.3	3.8	23.2
Virginia Runner G-26										
None	7.8	48.6	1.0	0.65	0.40	91.0	0.13	4.1	3.7	28.8
3½ months	5.1	48.6	1.0	0.44	0.40	91.0	0.13	3.9	3.8	28.5
3½ months	6.6	48.2	1.0	0.41	0.40	91.0	0.12	3.9	3.7	28.5
3½ months	7.7	48.6	1.0	0.66	0.38	90.5	0.13	4.2	3.9	29.3
3½ months	8.6	48.5	1.0	0.55	0.40	91.5	0.13	4.1	3.7	29.3
3½ months	11.2*	48.4	2.0	0.63	9.15	91.0	0.15	4.1	3.7	28.6

* Fungus growth was observed at these moisture levels.

Dixie variety (at 10.6% moisture) was thought to be due to the growth of seed storage fungi on these samples. Ward and Diener have reported on changes in stored peanuts caused by fungi (10).

Other differences noted were palatability and germinability. Dixie and Early were rated equal in palatability. G-26 was consistently rated the best-tasting by a taste-test panel. Dixie and Early germinated readily after curing, germinability being greater than 70%. G-26 gave only 10% germination immediately after curing, and required a rest period of several weeks before germinability reached 70%.

Differences in the three varieties in chemical composition, and stability during storage, were not great enough to be used as criteria for variety recommendations. However, differences did exist in oil content, sugar content, taste, germinability, and susceptibility to rancidity development during storage.

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The Preparation and Properties of Polyoxyethylene Methyl Glucoside Fatty Esters[1]

F.H. OTEY, T.E. YEATES, C.L. MEHLTRETTER, and C.E. RIST,
Northern Regional Research Laboratory,[2] Peoria, Illinois

New, nonionic, emulsifying agents, the polyoxyethylated methyl glucoside esters of some saturated and unsaturated fatty acids, are described. One series, Type A, was prepared by etherification of the glucoside esters. In another, Type B, the ethers of methyl glucoside were esterified.

In general, the esters exhibit good emulsifying action; the unsaturated esters, particularly Type B, also possess film-forming properties. Such compounds may have value in preparing emulsion paints. The surface tension of water is appreciably lowered by adding as little as 0.01% of the polyoxyethylene methyl glucoside esters.

GIBBONS AND SWANSON prepared methyl glucoside fatty esters by direct esterification and investigated the surface-active properties of several of the diesters (1,2). In general the methyl glucoside diesters of highly saturated fatty acids do not disperse in water. Reaction of ethylene oxide with fatty esters of sorbitan (3,4) and of sucrose (5) has produced polyoxyethylene ethers with enhanced water solubility and has extended applications of these carbohydrate derived products as emulsifying agents. It was therefore of interest to prepare polyethers of a number of fatty esters of methyl glucoside by reaction with ethylene oxide, and to investigate their surfactant behavior.

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[2] This is a laboratory of the Northern Utilization Research and Development Division, Agricultural Research Service, U.S. Department of Agriculture.