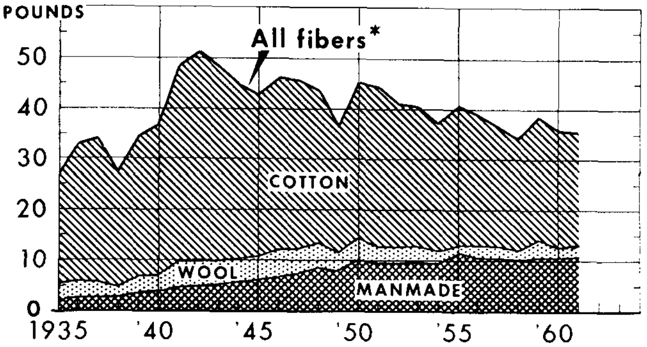
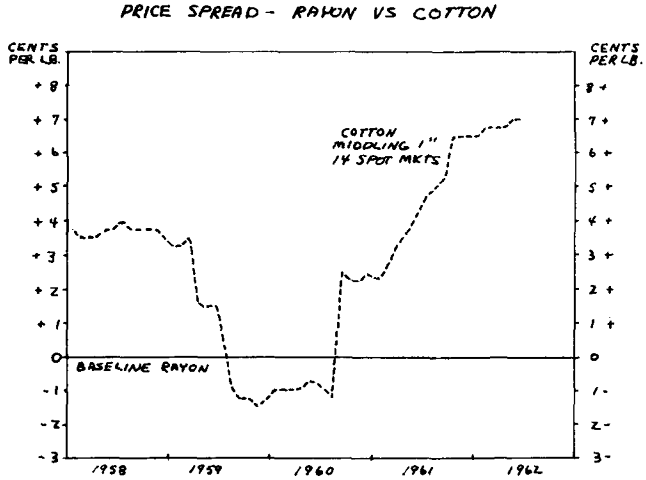
Fiber Foibles

Since both the short and long term future of cottonseed and its products are inextricably intertwined with the future of cotton fiber so it is important that we keep an eye on short and long term cotton fiber prospects. The 1963 cotton fiber acreage allotment will probably be announced by the time this article appears. In the season just ended, the cotton carryover increased by about ½ M bales—the first increase since 1955–56. The September cotton estimate was 14.7 M bales. Total consumption, export plus domestic, is expected to be 14.0–14.1 M bales, so another stock increase is in prospect. Presumably, two increases in a row imply pressure toward a lower acreage allotment.

Part of the trend to stock increases stems from loss of markets to synthetic fibers. It is true that a good part of the increased synthetic demand comes from special properties that cotton does not possess and likely will never possess. However, high price has "rationed away" some demand. The strong influence of "rationing away" is an old story for price supported U.S.A. agricultural commodities. Agricultural methods, economic conditions, and structures of comparative advantage keep shifting rapidly. Yet, U.S.A. support programs remain intensely resistant to rational revision and we drift from one supply "crisis" to another. Often, the final loser from excessive pricing is the producer, the man that the program was supposed to help. Pricing cottonseed oil too high fostered intensive research on substitutes. Pricing cotton too high subsidized foreign growths, justified some synthetic research, and encouraged construction of domestic and foreign rayon production capacity. When all this happens, winning back the lost markets becomes exceedingly difficult. Presumably, from any given point on, better pricing would help choke off some research and/or some construction.

MILL CONSUMPTION OF FIBERS, PER CAPITA





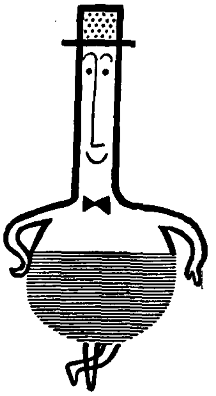
Before World War II, the U.S.A. produced more than half of the world's cotton and supplied two-thirds of the cotton in international trade. World cotton production is increasing while the U.S.A. position has deteriorated to the point that we furnish less than half the free world crop. Two-thirds of the cotton moving in world trade is now of foreign origin. Subsidies have enabled the U.S.A. to recapture some world demand, but export subsidies are an international sore spot. Domestically, rayon producers are having a field day. The premium of cotton over rayon staple has soared in the last two years. (See table.) The premium shown actually understates the competitive advantage of rayon as it makes no allowance for mill waste, transportation, or discounting of rayon prices below published list. The actual current advantage of rayon is probably 12–15¢/lb. This is the type of change I referred to earlier. Present support programs allow no way for the price to meet changing conditions. There is no question that the charted price relationship represents a huge change in the competitive structure.

Domestic per capita consumption of cotton in 1961 fell to 22.2 lb—the second lowest level since the mid-1930's. Only in 1958, when consumption reached 21.4 lb, has the figure been lower. On the other hand, consumption of man-made fibers reached an all-time peak of 11.4 lb/capita. Cotton's share of mill consumption dropped to a record low of 62.7%—a drop of 1.8% of the market in one year. Synthetic's share of mill consumption rose to 30.7%—the highest in history and was higher than a year earlier by the same 1.8% of the market that cotton was down. Cotton mills are being hurt by imported fabrics made of U.S.A. cotton shipped out under a huge subsidy. In all

(Continued on page 16)

Man-Made Fibers—Production in the United States and Foreign Countries
Annual 1950–1962 (Millions of Pounds)

Calendar year	United States			Foreign countries Free world			Foreign countries Communist world		
	Rayon and acetate	Non-cellulosic	Total	Rayon and acetate	Non-cellulosic	Total	Rayon and acetate	Non-cellulosic	Total
1950	1259	146	1405	1927	26	1953	366	5	372
1951	1294	205	1499	2296	51	2347	419	9	428
1952	1136	256	1392	1916	64	1979	483	14	497
1953	1197	297	1494	2415	88	2503	542	20	562
1954	1086	344	1430	2745	127	2872	639	24	663
1955	1261	455	1716	3046	179	3225	728	29	757
1956	1148	497	1645	3338	249	3588	777	37	814
1957	1139	626	1765	3475	354	3829	845	47	892
1958	1035	594	1629	3080	402	3483	914	56	970
1959	1167	793	1960	3429	602	4031	964	67	1031
1960	1028	854	1882	3667	860	4527	1045	90	1134
1961	1095	886	1981	3692	1043	4735	1148	117	1265



Meetings

A.O.C.S. National Meetings

1963—Atlanta, Atlanta Biltmore Hotel, April 22–24
Minneapolis, Radisson Hotel, September 30–October 2

1964—New Orleans, Roosevelt Hotel, April 19–22
Chicago, Pick-Congress Hotel, October 11–14

1965—Houston, Shamrock-Hilton Hotel, April 25–28
Cincinnati, October 11–13

1966—Los Angeles, Statler Hilton Hotel, April 24-27
Philadelphia, Bellevue-Stratford Hotel, October 4-6

1967—New Orleans, Roosevelt Hotel, May 7–10
Chicago

*1968—New York

A.O.C.S. Section Meetings

*North Central—Oct. 24, 1962, Nov. 28, 1962, Jan. 23, 1963, March 6, 1963, and May 1, 1963, at the Builders' Club, 228 N. LaSalle, Chicago, Ill.

*Northeast—Dec. 4, 1962, Feb. 5, 1963 and June 4, 1963, at Whyte's Restaurant, 141 Fulton St., New York. April 2, 1963, at the Essex House, Newark, N. J.

Other Organizations, 1962

Oct. 15–17—International Congress on Plastics and Problems of Choice, Amsterdam

Oct. 15–17—Federation of Societies for Paint Technology Annual Meeting, Chase-Pard-Plaza Hotel, St. Louis, Mo.

Oct. 15–18—VI Italian Congress on Fatty Materials, Societa Italiana Sostanze Grasse, Arezzo

Oct. 16–19—Annual Meeting of the American Council of Independent Laboratories, Edgewater Beach Hotel, Chicago, Ill.

Oct. 22–24—12th Canadian Chemical Engineering Conference, The Chemical Institute of Canada, Sarnia, Ontario, Canada

*Oct. 26—Fall Technical Conference of the Mid-Atlantic States Section of the Air Pollution Control Ass'n., at Hotel DuPont Gold Ball Room, Wilmington, Del.

*Nov. 7, 1962—New York Cosmetic Chemists, New York

Jan. 1963—Biochemistry Division, The Chemical Institute of Canada, Saskatoon, Sask., Canada

*Jan. 21–23, 1963—Seed Protein Conference, New Orleans, La. Foreign and U. S. scientists are expected to participate.

*Jan. 28–Feb. 1, 1963—Short Course on "Measurement Engineering," Arizona State University. Brochure may be obtained by sending letter-head requests to Peter K. Stein, Director, 1963 Short Course, Measurement Engineering, Associate Professor of Engineering, Arizona State University, Tempe, Ariz.

*Feb. 4–8—ASTM National Committee Meeting, at Queen Elizabeth Hotel, Montreal, Canada

*June 5–6—Symposium and 46th Meeting of the European Federation of Chemical Engineering, Frankfurt am Main

*June 23–28—Chalfonte-Haddon Hall, Atlantic City, N. J., American Society for Testing and Materials Annual Meeting

* Additions to previous calendar.

Interpretation of Various Assays for Vitamin A in Margarine[1]

ROBERT W. LEHMAN, Distillation Products Industries, Rochester, New York

Abstract

When margarine is fortified with all-*trans* vitamin A the assay result, whether obtained by colorimetry or spectrophotometry, should be the same as the biological potency. This paper reports the effects to be expected on each method of assay by some commercial sources of vitamin A that contain *cis*-isomers. In most cases the biological potencies are less than the potencies predicted by physicochemical procedures. Methods are presented to calculate the extent of assay differences introduced by these *cis*-isomers. Different commercial sources of vitamin A, in an amount required for 15,000 "biological" units, would give values ranging from 15,200 to 20,800 units by "blue-color" assay, from 15,100 to 19,000 units by uncorrected extinction coefficient, and from 15,000 to 18,000 units by the USP XVI assay.

Introduction

SEVERAL different assay methods are in use, or are of interest, for vitamin A in margarine. The USP method (spectrophotometry with Morton-Stubbs correction) is used on the vitamin A added to margarine. The margarine itself can be assayed by: growth rate of rats (Federal Standards of Identity), spectrophotometry with chromatography (AOAC), spectrophotometry with various methods for correcting blank absorption (NAMM, etc.), and antimony trichloride blue-color (Association of Vitamin Chemists). If all-*trans* vitamin A is the only form of vitamin A in the margarine, all methods should give the same "potency" figure. Differences in response will arise when 9-*cis* and 13-*cis* isomers of vitamin A are present. This paper describes the effect on assay results to be expected when various commercial types of vitamin A are used for fortification.

Vitamin A Isomers

The vitamin A molecule (Fig. 1) contains five conjugated double bonds, which give rise to the properties useful for assay.

One property is the formation of an intense blue color (absorption maximum at 620 mμ) when contacted with a chloroform solution of antimony trichloride. The "blue-color" assay has been very useful where vitamin A is present at low concentrations, as in foods. The reaction is reasonably specific, and relatively simple purification steps are required before application of the assay.

Another property of vitamin A that is useful for analysis is the ultraviolet band at 325 mμ. This measurement is usually more precise than that of the transient blue color, but it can be applied only to concentrates of fairly high purity. Often, extensive purification is necessary to remove other materials that absorb in the 325 mμ region. Where only low levels of extraneous absorption are present, a geometric correction may be applied, using absorbance readings at three wave lengths—usually 310, 325, and 334 mμ. This "Morton-Stubbs" correction (1) is part of the USP XVI assay procedure for vitamin A.

Previous publications (2,3,4) have reported the common occurrence of four geometric isomers of vitamin A, all-*trans*, 9-*cis*, 13-*cis*, and 9,13-di-*cis*. [Numbering is by the carotenoid system proposed (8) by the International Union of Pure and Applied Chemistry Commission on the Nomenclature of Biological Chemistry.] The latter two have very low biological activity (5,6,7). The all-*trans* isomer is the only one of the four that can be assayed reliably by a variety of analytical procedures. It is the "standard" for all procedures; a preparation of crystalline all-*trans* vitamin A acetate (in oil, capsulated) is distributed as a Reference Solution by the U.S. Pharmacopeia. Each of the other three isomers gives a different "potency" figure, depending on the assay procedure chosen. This is important to margarine analysts because: (a) several different assay procedures are commonly used, and assay results must often be transferred from one procedure to another; (b) several different commercial sources of vitamin A are in common use for the fortification of margarine, and these differ in their relative contents of the four isomers.

Assay Procedures

Four different procedures are of interest: (a) the antimony trichloride blue-color, (b) the uncorrected extinction coefficient at 325 mμ, (c) the USP XVI procedure (extinction coefficient corrected geometrically), and (d) bioassays. These are associated with margarine in the following ways:

The antimony trichloride blue-color procedure, applied to the unsaponifiable fraction of margarine, was judged in 1946 (9) by the vitamin A subcommittee of the National Association of Margarine Manufacturers (NAMM) to be the most generally applicable procedure. Its use was later supported by Luckmann, *et al.* (10). The four vitamin A isomers give the same "potency" figure per g by this procedure (11). However, since the isomers other than all-*trans* have lower biological potencies per g, the blue-color procedure overestimates the biological potency when these other isomers are present.

The uncorrected extinction coefficient is used in two different ways in the assay of vitamin A in margarine: (a) the vitamin subcommittee of NAMM (9), and Luckmann, *et al.* (10), suggest its use in a precise procedure for control work inside a margarine plant, where unfortified samples of margarine oils are readily available. The fat and aqueous phases of the finished margarine are separated, and a solution of exact concentration (25 g/100 ml for margarine at 16,500 u/g) made of the fat in cyclohexane. Another solution of exactly the same concentration is made

(Continued on page 18)

[1] Presented at the A.O.C.S. Meeting in Chicago, 1961.
Communication #282 from the laboratories of Distillation Products Industries, Division of Eastman Kodak Company, Rochester, New York.

(Continued from page 9)

planting should coincide with the commencement of the wet season.

Preparation of Land and Planting

The preparation of land for the final planting of the oil palm is undertaken while the palms are in the nursery, and should be timed to coincide with the wet season, when the palms are 12–18 months old in the nursery. When planting from jungle, this should be felled and burnt during the preceding dry season. Main drains, if necessary, can then be dug. The land is then cleared of unburnt timber and is ready for lining and holing. In case the land to be developed is under lallang, this is destroyed by tractor ploughing and harrowing, or by digging out the roots which should be heaped and burnt. The whole area should be kept free from further growth of lallang by wiping the lallang leaves with lallang oil. After any necessary main drains have been dug, lining and holing is carried out.

A suitable planting distance on flat or undulating land is 30 ft x 30 ft triangular which gives 55 palms/acre. Steep land should not be cleared and planted. A method of lining is shown in Figure 4. The procedure is as follows:

1. Lay down base line AB of any convenient odd number of points, e.g., 11 points 30 ft apart.
2. From A, lay down a line 60 degrees to the right, i.e., AC.
3. From B, lay down a line 60 degrees to the left, i.e., BC.
4. Check that the intersection of these lines at C bears 90 degrees from point D midway between A and B.
5. Mark off points every 30 ft along AC.
6. Mark off points every 30 ft along BC.
7. Join EF, GH, etc., and mark off in 30-ft lengths.
8. Every point should come into alignment in three directions.
9. Produce all lines in three directions to lay out the rest of the field.

After lining, any necessary field drains can be dug between the rows thus lined.

After lining and staking, planting holes are dug out (Fig. 5a) lot less than 2 ft sq and 2 ft deep at each point. Top soil from the holes is heaped near them and the subsoil thrown further away. The holes are left for a week or two, and then refilled. On all soils except peat, top soil is scraped together with 8 oz of rock phosphate (Fig. 5b). The mixture is filled into the hole and the stake replaced. On peat soils, the hole is refilled with burnt top soil mixed with 8 oz of fertilizer (Rubber Research Institute mixture G), plus 8 oz of magnesium limestone. The land is then ready for planting.

When transplanting from nursery to field, it is important to ensure that each palm is lifted with the roots still embedded in soil. Before lifting, the nursery beds are soaked with water and the soil around the roots of the palms is pudded. When lifted, the palm then rests in a separate

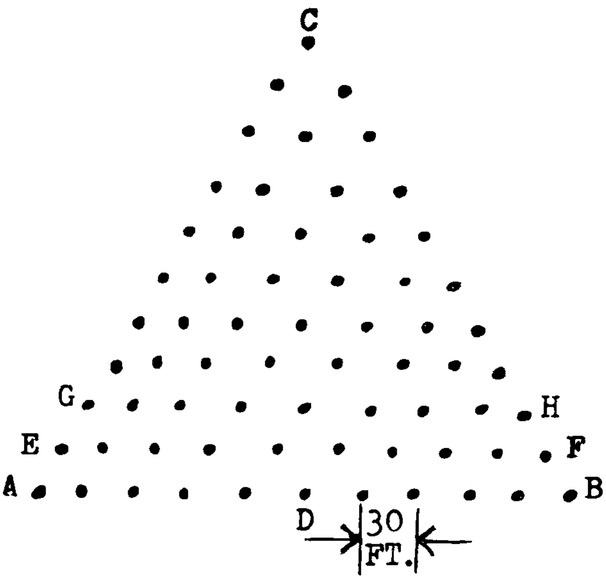


FIG. 4. Method of lining for triangular planting.

ball of earth, which should be planted with the palm. In handling, do not hold or carry the palms by the young spear of unopened leaves. If the soil crumbles, the ball of earth should be wrapped with a gunny bag for transplanting. Each palm can then be carried from the nursery to the field in a basket. Great care is necessary to avoid breaking the ball of earth, thereby severing or damaging the roots. A small hole is made in the refilled planting hole (Fig. 5c) to take the palm with the ball of earth surrounding the roots. The collar of the palm should be flush with the surface of the ground. The soil is well pressed (Fig. 5d) round the roots so that the palm is firmly fixed in the ground.

Maintenance and Manuring

Field work includes the maintenance of a suitable ground cover, the pruning of leaves, and manuring.

Ground covers, such as a mixture of half *Calopogonium mucunoides* and half *Centrosema pubescens*, should be established soon after the land is cleared, and maintained by regular weeding and ring weeding around the palms.

Leaf pruning should in no case be undertaken until the lowest fruit bunches are 3½ ft from the ground. From then until the lowest bunches are 5 ft from the ground, the leaf immediately below a bunch is pruned when the bunch is harvested. Thereafter supplementary pruning of a few leaves below those supporting the developing fruit bunches is carried out once a year. In pruning, the leaf is severed close to the trunk. The cut should be made in a sloping direction with a chisel while the leaves can be reached from the ground. Thereafter, harvesting knives attached to bamboo poles are suitable (see Fig. 6). After pruning, the leaves are laid on the ground lengthwise between the rows of palms.

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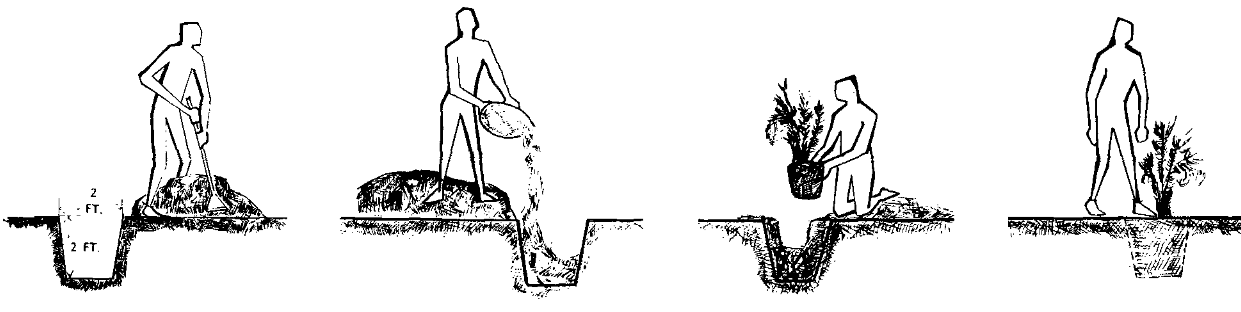

(A) SIZE OF PLANTING HOLE

(B) REFILLING PLANTING HOLE

(C) HOLE READY; SEEDLING WITH BALL OF EARTH

(D) PRESSING OF SOIL AFTER PLANTING

FIG. 5. Planting seedling in field.

Fiber Foibles . . .

(Continued from page 10)

this, we have ignored the open and the hidden costs of the many price bolstering methods. The costs, including waste of money and resources, are huge. Here and there across the belt, cottonseed mills have been closing. Lower cotton allotments and constant erosion of the position of cotton can only mean more mills closing down.

King Cotton must once again be allowed to compete. Prices must be allowed sufficient freedom to "ration" cotton into consumption. Long term defying of the market mechanism not only ruins the market, but creates economic anomalies that can only result in artificial and disruptive allocation of resources.

JAMES E. MCHALE, Merrill Lynch, Pierce, Fener & Smith, Inc.

New Vitamin E Data Revealed

Through a research program at Distillation Products Industries, Division of Eastman Kodak Co., Rochester, N. Y., some important new information about the biological activity of natural vitamin E and its function in animal reproduction has come to light. Results of the research provide information on the physiological action of vitamin E, knowledge that is expected to open the way to broader understanding of the uses of this vitamin in animal and human nutrition.

Kodak researchers, S. R. Ames and Marion I. Ludwig, of DPI Biochemistry Laboratories, reported their findings at the 142nd meeting of the American Chemical Society in Atlantic City, N. J. This work was described in the Aug. 20th issue of the *Journal of the American Chemical Society.*

The discovery is based on previous chemical research by DPI organic chemists, who recently succeeded in fractionating synthetic vitamin E into a *d*-form and an *l*-form. They found that the *d*-form was identical in its chemical properties with natural vitamin E derived from vegetable oils. The *l*-form had never been obtained in a pure state before.

At first, Dr. Ames and Miss Ludwig studied the preliminary, incompletely separated fraction, and found enough information to encourage the organic chemists to continue their project. The results of the compined pioneering study was the new information about the biological activities of both natural vitamin E and the *l*-form of the synthetic vitamin.

The biochemists followed the classical procedure of feeding graded doses to vitamin E-deficient rats, during the early pregnancy of the rats to determine the amount of vitamin necessary to support normal reproduction. After more than two years of research with the animals, they succeeded in establishing definitely that natural vitamin E (the *d*-form) has much greater potency than the *l*-form prepared synthetically. Repeated tests indicate that the *l*-form has only about 21% as much biological activity as natural vitamin E.

The discovery that the natural *d*-vitamin has far more biological activity in the reproductive test than the *l*-form prepared synthetically is a strong indication that the action of natural vitamin E is connected with specific enzyme functions in the body. The newly isolated *l*-form of the vitamin promises to be of major help to biochemists studying other biological actions of vitamin E.

• *Referee Application*

First Notice. Mr. Claude E. McLean, Jr. of Arizona Testing Laboratories, Box 1888, 817 W. Madison Street, Phoenix, Arizona, has applied for a Referee Certificate on cottonseed, oil cake and meal, fatty oils and protein concentrates. The Chairman of the Examination Board should be contacted by interested parties wishing to comment on this certification. Please write to Mr. N. W. Ziels, Chairman of the Examination Board, Lever Brothers Co., 1200 Calumet Ave., Hammond, Ind.