they are subjected to CO_2 pressure for two or more hours. The process may be repeated as often as desired although one treatment, as a rule, is sufficient to effect emulsification. By repeating the process several times a large percentage of the organisms may be disrupted. After the CO_2 treatment the emulsion is diluted to the desired standard with salt solution. In this way a perfectly homogeneous suspension of tubercle bacilli, which gives no sediment after standing several days without agitation, may be obtained. The addition of 0.2 per cent. trikresol enables the suspension to be kept in the laboratory indefinitely.

We have performed the agglutination reaction on three hundred cases, one hundred of which were known to have tuberculosis, and two hundred "normal" cases. With one exception all of the tubercular cases gave agglutination. Of the "normals" all but five gave a negative reaction. Of the cases five which gave the positive reaction four were suspected of having syphilis but only one of these had ever given a positive Wassermann. The tests were carried out by the macroscopic method. The serums were diluted 20, 40, 80, 160, 320 and 640 times respectively, placed in the incubator for two hours, and in the ice-box over night.

In this series of dilutions a proagglutinoid zone was noted in a majority of the positive cases, in that agglutination was rarely present in the tube containing serum in dilution of 1–20. Agglutination was very marked, often complete precipitation, in dilutions 40, 80, and 160 and somewhat irregular in the higher dilutions. It is important that the serums used be free from hemoglobin since we have found that hemoglobin causes a false agglutination of the tubercle bacillus. From these results we believe the agglutination test will prove of value in the diagnosis of tuberculosis.

175 (1922)

Correlations among the constituents of potato tubers.

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It has long been known that both the total dry matter and the starch content of potato tubers are proportional to the specific

gravity; in fact in factory practice Märker's[1] table of specific gravities is commonly used in assaying potatoes for starch. Also, the starch content and dry matter are correlated positively with mealiness, whereas high protein causes sogginess. According to American standards mealiness is desirable; in Europe the reverse is true. Therefore it would seem that attempts to develop a high protein potato and still to maintain desirable culinary properties were doomed to failure, although East[2] was convinced otherwise, provided a high dry-matter content be maintained.

In 1911 56 samples of potatoes, representing 4 varietal groups, and grown under various conditions in different parts of Minnesota, were collected and analyzed at this station, with a view to determining the factors which affect the composition. It seemed desirable to utilize these data still further by calculating the coefficients of correlation among all the constituents of the tubers. The results of these calculations appear in Table I. Both starch and soluble sugars were determined, but the sum of the two only is here presented. The starch represents about 95 per cent. of the two.

It will be seen that there is an intimate relation between specific gravity and dry matter, which is to be expected. It will be further noticed that there is no correlation whatsoever between carbohydrate and dry matter and between nitrogen and dry matter. This is not contrary to the relation stated above between specific gravity and starch, since in factory practice the starch content is considered on the wet basis, and in this table all calculations are on the dry basis. The nitrogen and carbohydrate vary inversely with each other, which is naturally the case with the two main constituents of a tissue, totaling 80 per cent. of the dry matter. Also as the dry matter increases the ether extract increases, and the ash decreases.

These relations can be stated in another way: A higher dry-matter content does not simply mean a loss of moisture, else there would be no change in the ratios of constituents. The formation of a higher dry matter content means the laying down of more ether extract material, as evidenced by the coefficient of + .333

[1] Märker, M. H., *Landw. vers. Stat.*, 1880, xxv, 107.

[2] East, E. M., Ill. Agr. Exp. Sta., 1908, Bull. 127, p. 135.

± .078. It must also mean the simultaneous laying down of more protein and carbohydrate, for the following reasons: (1) the amount of ether extract found in tubers is insufficient to account for all the increase in dry matter; (2) the protein and carbohydrate are sufficient to account for it; (3) the protein and carbohydrate are not correlated with the dry matter, but are correlated with each other negatively. As these organic constituents are increased the minerals are decreased, as is evidenced by the coefficient of −.380 ± .076 between the ash and dry matter. In fact the ash bears a negative relation to all the other factors studied, although in the majority of cases the coefficient is too small to be of significance.

From the above data we can conclude that it should be entirely possible to improve the potato tuber as regards protein, provided the dry matter be increased. Mealiness can then still be maintained. This improved tuber will probably be spheroidal, instead of long in shape, since the longitudinal diameter is correlated positively with the starch content.[1]

TABLE I. SUMMARY OF CORRELATIONS AMONG THE VARIOUS FACTORS IN POTATO TUBERS.

	Dry Matter.	Nitrogen.	Ash.	Ether Extract.	Starch plus Sugar.
Specific gravity	+.637±.054	−.233±.084	−.311±.082	−.164±.087	+.218±.086
Dry matter....		+.034±.090	−.380±.076	+.333±.078	+.059±.090
Nitrogen.....			−.052±.090	+.216±.086	−.590±.058
Ash.....				−.116±.088	−.223±.085
Ether extract..					+.004±.090

176 (1923)

Yeast as a source of vitamine-B for the growth of rats.

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Yeast is commonly considered the richest source of vitamine-B for the growth of young animals. We have fed groups of rats

[1] Renski, M. D., Abs. in *Exp. Sta. Rec.*, 1911, xxiv, 439.