SPROUTED COWPEAS AS A SOURCE OF PROTEIN AND VITAMINS

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One of the most difficult problems confronting agricultural agencies at the present time is the production and distribution of fresh vegetables, fruits, eggs, milk, and milk products in quantities sufficient to meet the needs of the Army and civilian population. These products, which are rich sources of many essential vitamins and minerals, have come to be known as "protective foods"; they afford protection against such dietary deficiency diseases as scurvy, pellagra, and rickets, and promote the general health of people subsisting on foods restricted largely to refined cereals, legumes, sugar, and fat. Meat has recently been included among the protective foods because of its content of vitamins and other accessory food factors.

A shortage of these protective foods, due largely to economic considerations, has brought about a renewed interest in the use of sprouted cereals and tender shoots of plants for human food. The chief attributes of these products are those usually ascribed to the constituents of fresh fruits and vegetables. Recently, sprouted soybeans have received popular acclaim as a food which not only supplies many of the vitamins of fresh vegetables but also provides protein of excellent quality. The seeds are readily available and may easily be sprouted as needed in home-made devices. Nutritionists have advocated their use as both vegetable and meat substitutes; mung-bean sprouts have been used as food in the Orient for many years. The possibility that cowpeas, a legume common to the Southwest, might be sprouted to produce a fresh food of acceptable quality was suggested as a result of these experiences.

EXPERIMENTAL

Successful sproutings of Chinese Red cowpeas (*Vigna sinensis*) and dwarf green mung beans (*Phaseolus aureus*) were made in 8-inch flower pots at temperatures between 70° and 80° F. Fifty grams of the seeds were first soaked in water for 8 hours and then placed on a thin pad of cheesecloth fitted to the bottom of a flower pot. The seeds were covered with another pad of cheesecloth and rinsed with about 500 ml of water containing approximately 1 gram of calcium hypochlorite (bleaching powder). The pots were loosely covered and set at an angle in a closed cupboard for the seeds to germinate.

The seeds were rinsed each night with the hypochlorite solution to inhibit mold development. During the day the seeds were rinsed, without removing the cheesecloth, every four hours with tap water. The cheesecloth pads maintained a high humidity and tilting the pots allowed air circulation and escape of carbon dioxide. The closed cupboard excluded light and minimized fluctuations of room temperature.

At the end of 96 hours the seeds had developed sprouts from 2 to 4 inches long. The sprouted seeds, after separation from hulls and unsprouted seeds, were weighed and representative portions taken for the determination of ascorbic acid (vitamin C) and proximate composition.

Several attempts to sprout peanuts under the above conditions yielded poor results.

RESULTS AND DISCUSSION

Fifty grams each of cowpea and mung-bean seeds produced 130 grams and 200 grams, respectively, of edible fresh sprouts. Inedible material, composed of hulls and seeds that failed to sprout, amounted to about 55 grams. The sprouts contained about 85 percent of water; consequently, the total dry matter recovered as sprouts was only about half that originally present in the dormant seed. More favorable conditions of sprouting would doubtless allow a greater recovery of material. The loss of dry matter due to metabolic processes during sprouting was calculated from the dry matter content of an equal number of hulled seeds and sprouts. This loss, which was confined to the nitrogen-free extract portion of the seeds, amounted to 21 percent for cowpeas and 15.7 percent for mung beans.

The composition of the seeds and sprouts is given in Table I. The average composition of soybeans and soybean sprouts is also given in this table for purposes of comparison. It should be noted that the dry matter of the sprouted seeds was higher than that of the original seeds in all constituents except nitrogen-free extract. The high protein content of the cowpea and mung-bean sprouts, although considerably less than that of soybean sprouts, is especially important from a nutritional standpoint. Legumes are commonly used as an economical source of protein in animal and human diets. By sprouting the seeds they acquire the form, flavor, and consistency of a fresh food without loss of protein and with the gain of vitamins frequently lacking in processed grains. The vitamins associated with the B-complex (riboflavin, niacin, biotin, pantothenic acid and others) have been found to increase in significant amounts during germination of cereal grains. Presumably, similar increases occur during the germination and sprouting of legume seeds. In the present experiments, ascorbic acid was formed in cowpeas and mung beans during sprouting to the extent of 131 mg and 128 mg, respectively, per 100 grams of dry material. The value of the uncooked sprouts as a source of this vitamin is thus apparent.

These experiments merely indicate the potential capacity of seeds to synthesize quickly and in an edible form many of the vitamins and food factors commonly associated with the vegetative parts of mature plants. Dormant seeds are essentially storehouses of reserve food, their synthetic powers being released only under favorable moisture and temperature conditions. With proper care, they can be stored indefinitely, transported from place to place, and sprouted as needed to provide "protective food." The selection of varieties and strains which are most suitable for sprouting and which provide the greatest amount of nutrients are matters for further study. Likewise, environmental factors and special treatments which hasten germination are subjects for systematic investigation with selected varieties of seeds. In this connection, plant hormones affecting development and growth may prove to be of value. Finally, biological tests need to be made to detect any alteration in the nutritive value of the protein and other major constituents as a result of sprouting.

SUMMARY

Chinese Red cowpeas which are common to the Southwest and Dwarf Green mung beans were sprouted between wet pads of cheesecloth in flower pots at temperatures ranging from 70° to 80° F. The seeds developed sprouts from 2 to 4 inches long in 96 hours. Peanuts failed to produce sprouts of desirable size under these conditions.

Fifty grams of cowpeas produced 130 grams of clean fresh sprouts. The theoretical yield was 220 grams of sprouts containing 85 percent water. There was a consistent loss of carbohydrates from the seeds resulting from

metabolic processes, and a variable loss of total dry matter due to hulls and seeds that failed to sprout. The dry matter of the sprouted seeds contained 31 percent of protein and 0.131 percent of ascorbic acid. Mung beans gave higher yields of sprouts which contained 35 percent of protein and 0.128 percent of ascorbic acid. The high protein content of these materials and their nutritional qualities, which presumably are superior to those of the original seeds, provide a tentative basis for their evaluation as food.

TABLE I

Composition and ascorbic acid content of cowpea, mung-bean, and soybean seeds and sprouts.

Description	H_2O	Percentage composition of dry matter					Ascorbic acid (mg per 100 gm dry matter)
		Ash	Protein	Fat	Crude fiber	N.F.E.	
Dormant							
Cowpeas	8.8	3.6	25.0	2.2	4.6	64.6	0
Mung beans	9.7	3.5	26.5	1.6	4.1	64.3	0
Soybeans [a]	7.5	5.1	37.7	19.6	5.4	32.2	0
Cowpeas, no hulls	7.8	3.5	26.4	2.3	1.1	66.7	0
Mung beans, no hulls	6.6	3.9	29.5	2.3	0.9	63.4	0
Sprouted							
Cowpeas	82.7	4.1	31.0	3.7	3.5	57.7	131
Mung beans	87.9	4.6	35.4	3.1	4.5	52.4	128
Soybeans [a]	82.3	6.2	48.0	10.2	5.1	30.5	

[a] Chatfield, C., and G. Adams. U.S.D.A. Cir. 549, 1940.