

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF PLANT INDUSTRY,
OFFICE OF THE CHIEF,
Washington, D. C., September 1, 1905.

SIR: I have the honor to transmit herewith a paper entitled "Okra: Its Culture and Uses," and to recommend its publication as a Farmers' Bulletin. This paper was prepared by Mr. W. R. Beattie, Assistant Horticulturist of this Bureau.

Respectfully,

B. T. GALLOWAY,
Chief of Bureau.

HON. JAMES WILSON,
Secretary of Agriculture.

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OKRA: ITS CULTURE AND USES.

INTRODUCTION.

From time to time the list of American garden crops has been increased either by the addition of one already in use in the Old World or by the improvement and domestication of our wild species. In the case of okra the former is true, as it has been in use in the Mediterranean regions for centuries. In the Southern States it has been extensively used for many years, but up to the present time has been cultivated to only a slight extent in the middle and northern section of this country.

Okra has no great food value, and it is not probable that it will ever become a very important crop commercially, but a few plants form a desirable addition to the vegetable garden. It is used principally for flavoring soups and preparations wherein meat forms an important part, and to these it adds a very pleasant taste and mucilaginous consistency. Some persons may not enjoy the flavor of okra at first, but after eating a few times of dishes containing it a taste for it is acquired.

BOTANY AND GEOGRAPHY OF THE PLANT.

Okra, or gumbo,^a as it is commonly called (*Hibiscus esculentus* L.), is a tropical annual belonging to the order Malvaceæ. This order includes some important economic plants, of which cotton and okra have the greatest commercial value, and such ornamentals as the abutilons and many varieties of hibiscus. The okra plant somewhat resembles that of the cotton, though having much larger and rougher leaves and a thicker stem. Its flowers are similar to those of the cotton in size, shape, and color, are always single, and there is very little variation between those of different varieties.

The original home of the okra plant is not definitely known, but it is either Africa, the West Indies, or Central America. De Candolle,

^a Sometimes spelled "gombo."

after a discussion of the matter, concludes that okra must have had its origin in Africa, since it is mentioned as having been under cultivation by the Egyptians as early as 1216 A. D., long before the discovery of America. The fact that many tons of okra pods are annually grown and consumed in Turkey, the northern part of Africa, and the Mediterranean region generally, and that their use in America is limited to recent years, would tend to strengthen the theory of African origin.

Reference to the American seed-trade catalogues will show that okra is entered therein under more than fifty varietal names, the greater number of which are synonymous. The pods have found use throughout the Southern States, especially near New Orleans, where the employment of Creole cooks has created a greater demand. While the commercial value of this crop is at present not great in this country, the demand is constantly increasing. It is the purpose in this bulletin to encourage a more general distribution and use of okra by giving cultural hints, descriptions of a few of the leading varieties, and directions as to some of the methods of preparing the pods for food.

Okra may be grown throughout the greater portion of the United States, but only one crop can be produced during a season in the northern part of the country. In the region around New Orleans successive plantings are made and a constant supply is maintained. The plant is of a tropical nature and will not endure frost, but the pods begin to be produced very soon after the plants start into rapid growth and continue to form for several weeks, especially if all pods are removed while young and no seeds allowed to ripen upon the plants.

THE SOIL AND ITS PREPARATION.

The soil upon which okra can be most successfully grown is a rich mellow loam, plowed rather deeply and well worked over with pulverizing tools. After the seedlings become established and the roots get a firm hold of the soil, the growth is very rapid and a large amount of available plant food, especially of a nitrogenous nature, is required. Quick-acting commercial fertilizers may be applied in moderate quantities, but these should be well mixed with the soil. The same conditions that will produce good cotton or corn will be found suitable for the production of okra.

PLANTING THE SEED.

Throughout the Northern States planting should be done as early as possible in spring, or as soon as the soil is warm enough for the planting of general garden seeds. In the Southern States, where a continuous supply is desired, successive seedings of four or five weeks

apart should be made. Plant in rows, $3\frac{1}{2}$ feet apart for the dwarf types and $4\frac{1}{2}$ feet for the larger-growing varieties. Scatter the seeds in drills, or plant loosely in hills, as with corn, and cover to a depth of 1 or 2 inches, according to the compactness and moisture content of the soil. The seeds may be planted with any good seed drill, but when placed in hills they should be separated 3 or 4 inches to allow space for the development of the stems. If the soil is reasonably warm, germination will take place within a few days, but should there be a heavy rainfall in the mean time the soil should be lightly cultivated between the rows and the crust broken over the seed by means of an iron rake.

CULTIVATION.

As soon as the plants are well established they may be thinned to three or four in a hill, or, if grown in drills, to 12 or 14 inches for the dwarf and 18 to 24 inches for the larger growing varieties. Where vacant places occur from failure in germination they may be filled in by transplanting. Cultivate as in the case of corn or cotton, keeping the ground well stirred and the surface soil loose, especially while the plants are small. After the leaves begin to shade the ground, very little cultivation is necessary except to keep the land free from weeds. A poor soil and insufficient moisture will yield pods of inferior size and quality, and irrigation may often be desirable in order to produce a marketable crop.

Okra is sometimes grown as a mixed crop with cotton, the okra being removed before the cotton begins to mature; but this practice is not to be recommended, as both crops draw heavily upon the nitrogenous matter of the soil. The okra plants will usually continue to grow until late in the season, but after a time the pods are not so large or tender as those produced earlier in the season. As the pod is the only part of the plant ordinarily used for food, it is desirable to secure a rapid and continuous growth in order to produce the greatest quantity of marketable pods.

GATHERING AND MARKETING.

As soon as the plants begin to set fruit the pods should be gathered each day, preferably in the evening. The flower opens during the night or early morning and fades after a few hours. The pollen must be transferred during the early morning, and the pod thus formed will usually be ready for gathering during the latter part of the following day, although the time required to produce a marketable pod varies according to the age of the plant and the conditions under which it is grown. The pods should always be gathered, irrespective of size, while they are still soft and before the seeds are half grown.

Figure 1 shows a flower, together with the pods formed the two previous mornings, the middle one of which is in the proper condition for gathering. The full-grown pods shown to the right and left of the flower were from those allowed to mature for seed. The pods, after being gathered in large baskets, are sorted and placed upon the market in pint, quart, and half-peck berry boxes. To be in first-class condition the pods should reach the consumer within thirty-six hours after having been gathered, but may be kept for several days in



FIG. 1.—Flower and pods. Pod in center in prime condition for gathering; the larger pods have been allowed to mature for seed.

cold storage or by moistening and spreading them thinly upon wood trays in a cool cellar. The pods should never be shipped in tightly closed crates or in great bulk, as they have a tendency to become heated.

CULTIVATION FOR SEED.

If okra is to be grown for seed alone, only one variety should be planted, or if more than one variety is grown each should be separated from the other by at least one-fourth mile to prevent mixing.

When several varieties of okra are grown near each other no seed should be saved except that produced by the method of bagging and hand pollination. To secure seed in this way is a rather simple matter when only a small quantity is required, as the pods formed on a single day when the plants are at their best will produce enough seed. The bags should be tied over the flower buds in the evening and the pollen transferred early the following day. Replace the bags immediately, as an insect or the wind may at any moment bring to the flower the pollen of another variety. After going over all the flowers of a variety it is well to return to the first three or four and repollinate them in order that they may receive pollen from different individual flowers of the same variety and to insure perfect fertilization. Before beginning upon another variety the brush used for transferring the pollen should be thoroughly cleaned. If a brush is not available, use a portion of a young leaf, folded together between the thumb and finger, to convey the pollen. This improvised brush should be discarded and a new one adopted for each variety. The bags need remain only during the day on which the pollen is transferred and may be replaced by a tag to mark the pod. The seed should remain on the plant until fully ripe.

The common bumblebee is a frequent visitor to the flowers of the okra, and a single bee was on one morning observed to pollinate over 500 flowers, comprising more than 50 separate samples. In this instance practically every flower in the field was visited and pollinated, although no pollen had previously been transferred. This observation demonstrated the necessity of great care to prevent cross-pollination. Our variety tests with okra have shown that seed growers have not always succeeded in keeping the varieties separate, and as a result there has been a gradual blending together of all the sorts. In many of the samples all the sorts usually grown are represented.

INSECT ENEMIES AND THEIR CONTROL.

Thus far no especially injurious insects have been reported for the okra crop. Several species have been observed working on the plants by Dr. F. H. Chittenden, of the Bureau of Entomology, but none is particularly injurious. Among these are leaf hoppers, aphides or plant lice, plant bugs, and some forms of caterpillars. The bollworm and other cotton-feeding insects also affect okra. For information on this subject apply to the Bureau of Entomology.

USES.

The principal use of okra is in soups and various culinary preparations in which meats form an important factor, as in the so-called

gumbo soups, to which the young pods impart an excellent flavor,



FIG. 2.—Large pods dried for winter use.

besides giving a pleasant mucilaginous consistency. The young seeds are occasionally cooked in the same way as green peas, and the very young and tender pods are boiled and served as a salad with French dressing. Both the stem and the mature pod contain a fiber which is employed in the manufacture of paper.

In countries where large quantities of the pods are consumed, they are dried and preserved to be used during the part of the year when a fresh supply can not be obtained. There are several methods of drying the pods. By one of these the pods are cut into slices crosswise and about one-

half inch thick; the slices are then spread upon muslin-covered frames and dried, after which the okra is stored in thin bags until required for use. By another and a more common method, the very young pods are strung upon coarse threads and hung up to dry (fig. 2). In Turkey alone there are tons of the pods preserved in this manner each year. A variety much used for drying is that known as *petite gumbo*, or small okra. The pods of this variety are selected when only about one-half inch in length and of uniform size. These are strung on a string of coarse fiber and hung up to dry (fig. 3).

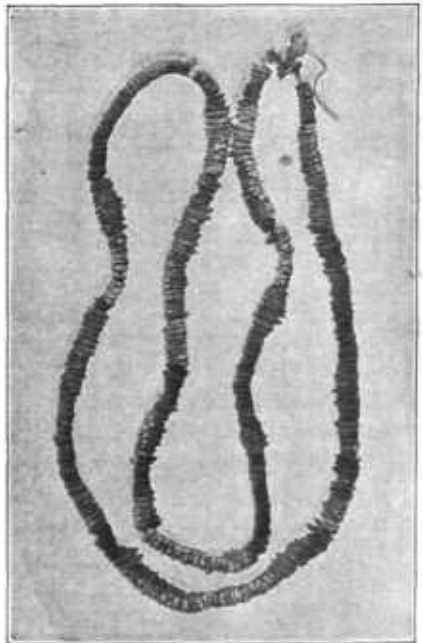


FIG. 3.—Small pods dried for winter use.

No copper, brass, or iron cooking vessels should be employed in preparing okra, as the metal will be absorbed and the pods discolored or even rendered poisonous.

The cooking should be done in agate, porcelain, or earthen ware.

METHODS OF PREPARING.

The following are recipes for a few of the preparations of which okra forms a part. With two exceptions, they are all taken from the Picayune's (New Orleans) Creole Cookbook.

OKRA SOUP.

2 pounds of beef, without fat or bone;
 2 cups of okra, chopped fine;
 One-fourth pound of butter;
 4 quarts of cold water;
 1 onion, sliced and chopped;
 Salt and pepper.

Cut the beef into small pieces and season well with pepper and salt. Fry it in the soup kettle with the onion and butter until very brown. Then add the cold water and let it simmer for an hour and a half. Add the okra, and let it simmer gently for three or four hours longer.

WINTER OKRA SOUP.

1 can of good New Orleans okra;
 1 can of tomatoes;
 2 onions, chopped fine;
 2 tablespoonfuls of butter;
 1 dozen oysters;
 3 tablespoonfuls of rice;
 A red pepper pod, without the seeds.

Chop the onions and fry them in the butter. Wash the rice well, then stew the onions, tomatoes, and pepper together in about three quarts of water and one pint of oyster water, for about three hours, stirring frequently. Ten minutes before serving add the okra and let it come to a boil. Then drop in the oysters, boil up once, and serve.

OKRA GUMBO.

1 chicken;
 1 onion;
 One-half pod of red pepper, without the seeds;
 2 pints of okra, or about 50 pods;
 2 large slices of ham;
 1 bay leaf;
 1 sprig of thyme or parsley;
 1 tablespoonful each of lard and butter;
 Salt and cayenne to taste.

Clean and cut up the chicken. Cut the ham into small squares or dice and chop the onion, parsley, and thyme. Skin the tomatoes and chop fine, saving the juice. Wash and stem the okras and slice into thin layers of one-half inch each. Put the lard and butter into the soup kettle and when hot add the chicken and the ham. Cover closely and let it simmer for about ten minutes. Then add the chopped onions, parsley, thyme, and tomatoes, stirring frequently to prevent scorching. Then add the okras, and when well browned add the juice of the tomatoes, which imparts a superior flavor. The okra is very delicate and is liable to scorch if not stirred frequently. For this reason many Creole cooks

fry the okras separately in a frying pan, seasoning with the pepper, cayenne, and salt, and then add them to the chicken. Equally good results may be obtained with less trouble by simply adding the okra to the frying chicken and watching constantly to prevent scorching. The least taste of a "scorch" spoils the flavor of the gumbo. When well fried and browned, add about 3 quarts of boiling water and set on the back of the stove to simmer for about an hour longer. Serve hot with nicely boiled rice. Round steak may be substituted for chicken, but it must be borne in mind that the chicken gumbo is the best flavored.

Another recipe for okra gumbo which is very similar to the one just preceding, the manipulation being practically the same, is as follows:

- 1 quart of tomatoes, sliced;
- 2 pounds of good beef, cut in small pieces;
- 2 quarts of okras, sliced;
- 4 tablespoonfuls of butter;
- One-half pound of corned ham or pork, cut up;
- Small piece of red pepper, without the seeds;
- Spray of parsley.

OKRA SALAD.

Boil the young okra pods whole. When cold, dress with vinegar, salt, and pepper, or, if preferred, use plain French dressing and serve very cold. This is a most delightful summer salad, the okra being very cooling.

BOILED OKRA.

- 1 quart of young okra;
- 1 tablespoonful of vinegar;
- Salt and pepper to taste.

Wash the okra well in cold water and place in a porcelain or agate saucepan. Add a pint of water and a teaspoonful of salt. Cover the saucepan and let the okra simmer for about half an hour. Place in a dish, season with salt and pepper, pour over the okra a tablespoonful of tarragon vinegar, and set to cool. Serve as a salad with roast meats, etc.

BAKED GUMBO.

Place a thin layer of rice in a baking dish, add a layer of sliced okra, then a layer of sliced tomatoes; add salt, pepper, a little currie, and a small lump of butter. Repeat with alternate layers of rice, okra, and tomatoes until the dish is filled. Cover and bake in the oven until the rice is thoroughly cooked. Remove cover and brown on top. Serve in the baking dish. The rice should be washed in cold water before using, and the okra pods and tomatoes washed and sliced rather thinly.

VARIETIES.

There are three general types of okra, viz, tall green, dwarf green, and lady finger.

Each of these is again divided according to the length and color of the pods, making in all six classes or varieties, namely, tall green,

long pod; tall green, short pod; dwarf green, long pod; dwarf green, short pod; lady finger, white pod; and lady finger, green pod. All variations from these are merely the results of mixtures, no true crosses or hybrids being formed. These mixtures are easily separated and referred to the parent type, and a little attention to roguing and selection is necessary in order to keep the varieties pure. It is essential that the varietal strain should be pure in order that a uniform and marketable lot of pods may be produced.

DESCRIPTION OF TYPES.

Tall green.—Height of plant, 4 to 8 feet; habit of growth, upright, not spreading, sometimes branching near the ground, but all stems erect; leaves large, borne on long petioles; pods in axils of leaves, on short stem; color of pods, green.



FIG. 4.—Tall green, long-pod type.

Tall green, long pod.—Pods long, 3 to 5 inches when ready for marketing, 7 to 11 inches when mature; five-eighths to $1\frac{1}{4}$ inches in diameter; 5 to 8 sided. (Fig. 4.)

Tall green, short pod.—Pods short, $1\frac{1}{2}$ to 2 inches when ready for marketing, 3 to 5 inches when mature; 1 to 2 inches in diameter; 7 to 11 sided. (Fig. 5.)

Dwarf green.—Height of plant, 20 inches to $3\frac{1}{2}$ feet; habit of growth, bushy, spreading from near the ground; leaves rather small, on slender petioles; pods green.



FIG. 5.—Tall green, short-pod type.

Dwarf green, long pod.—Pods long, 2 to 4 inches when ready for

marketing, 6 to 10 inches when mature; five-eighths to $1\frac{1}{4}$ inches in



FIG. 6.—Dwarf green, long-pod type.

diameter; 5 to 8 sided, tapering to point at blossom end, point usually curved inward toward the stem of the plant; leaves deeply cleft or divided. (Fig. 6.)

Dwarf green, short pod.—Pods short, $1\frac{1}{2}$ to 3 inches when ready for marketing, 3 to 6 inches when mature; $1\frac{1}{2}$ to $2\frac{1}{2}$ inches in diameter when fully grown; 7 to 12 sided; leaves large, almost entire. (Fig. 7.)

Lady finger.—Height of plant, about 3 feet, very much branched and of bushy habit; leaves large, borne on long petioles, the lower ones sometimes more than 2 feet in length. The entire plant is

of a lighter color than either of the other types. The only distinction between the varieties of this type is found in the color of the pods. Pods 4 to 5 inches long when ready for gathering, 6 to 10 inches when mature; three-fourths to $1\frac{1}{4}$ inches in diameter when mature; slightly 7 to 8 angled; and covered with numerous soft hairs. (Fig. 8.)

Lady finger, white pod.—Pods greenish white or nearly white.

Lady finger, green pod.—Pods pale green, in some cases nearly pure green.

IMPORTED VARIETIES.

The following varieties of okra have been imported by the Department of Agriculture.



FIG. 7.—Dwarf green, short-pod type.

The serial numbers are taken from the various inventories of the Department.

3291. From Algeria. Received through Mr. W. T. Swingle, 1899. Donated by Doctor Trabut, government botanist of Algeria.

The above-named importation is known as "White Louisiana." Rather dwarf; 2 to 2½ feet high; spreading. Pods 8 to 10 inches long when fully grown, slightly curved and tapering at the point; surface of pods almost smooth, slightly 7 or 8 angled, pale green or almost white. This variety yielded better than any other. The pods are tender and keep remarkably well. Lady finger, white-pod type (fig. 8).

2565. From Smyrna. Received through Mr. W. T. Swingle, 1899. Seeds purchased from a Greek gardener.

This variety is a good grower, reaching a height of about 4 feet. The leaves are average size. Pods long and slender, being 8 or 10 inches in

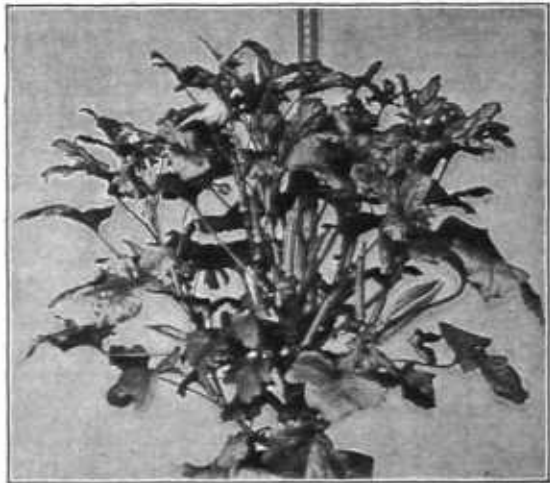


FIG. 8.—Lady-finger type.

length and only three-fourths in diameter: very tender; free from strings; and of a light-green color. It is very productive and sets pods in a comparatively short time after planting. Tall green, long-pod type.

3632. From Kasaba, near Smyrna. Received through Mr. W. T. Swingle, 1899. "Sultanie."

The "Sultanie" variety grows to a height of about 4 feet, with slender stems. The leaves are average size, rich in color, and abundant. The pods are 3 to 6 inches long, three-fourths inch in diameter, and 8-sided. A moderate producer, and the pods are not so tender as some others. Tall green, short-pod type.

3636. From Aidin. Received through Mr. W. T. Swingle, 1899. This is a dwarf variety, growing only about 20 inches in height.

The pods are 3 to 5 inches in length when mature, blunt at point, 8 or 10 sided, and must be gathered while quite small, as they soon become tough and stringy. While this variety produces only a moderate crop and continues but a short time, it is worthy of cultivation for its earliness and may be discarded after the other varieties come

into bearing. Dwarf green, short-pod type, of which it is an early selection.

3906. From Venice, Italy. Received through Messrs. Lathrop and Fairchild. 1899. Grown from seed imported from Constantinople into Venice from the monastery of San Lazare.

This variety grows about $4\frac{1}{2}$ feet high; stems slender. The pods are 6 to 10 inches long and five-eighths inch in diameter, 7 or 8 sided, very tender, and keep well. This is a late variety, very productive, has a well-formed pod, and is one of the most desirable sorts. Tall green, long-pod type.

3979. From Cairo, Egypt. Received through Messrs. Lathrop and Fairchild, 1899. A long-fruited native Egyptian variety.

This is a strong grower of the dwarf class. Its leaves are large and borne on long petioles. Pods 6 to 10 inches long when mature, 4 to 5 inches when ready for marketing; 7 or 8 angled, and covered with numerous soft hairs; produces well, and the pods remain tender for a long time after gathering. A splendid new variety. Lady finger, green-pod type.

3980. From Cairo, Egypt. Received through Messrs. Lathrop and Fairchild, 1899. Short-fruited variety.

This variety is rather stocky and a good grower, 3 to 4 feet high, with very thick stems. Leaves large, on rather long heavy petioles; pods 4 to 5 inches long and $1\frac{1}{2}$ inches in diameter, 7 to 11 sided, and free from prickles. This is a splendid variety, but the pods become tough and stringy if allowed to remain too long upon the plant. The pods will keep a long time, however, if removed while tender. Tall green, short-pod type.

SUMMARY.

Okra may be considered a desirable addition to the farmer's garden, and it can be grown in almost any locality.

Okra can be produced on any good soil, and the crop requires no special attention other than that which would ordinarily be given a crop of corn or cotton.

Plant early in the spring, or as soon as all danger of frost has passed; keep the pods well picked, in order that the plants may not become exhausted by the maturing of the seed, and the pods will continue to be produced until late in the fall.

Do not cook the pods in plain iron cooking utensils or in copper or brass.

Remember that the taste for the okra flavor has to be acquired by some persons.

The varieties of okra best adapted to general use are the dwarf green, long-pod (fig. 6), and the lady-finger ("White Louisiana") types (fig. 8).