

UNIVERSITY OF ARIZONA

Arizona
Agricultural * Experiment
Station.

BULLETIN NO. 22.

SOMETHING ABOUT WEEDS.



If the farmer does not kill the weeds that appear on his farm, they become in time the greatest monopoly with which he has to contend.

Tucson, Arizona, January, 1897.

Arizona Agricultural Experiment Station.

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The Experiment Station respectfully solicits suggestions relating to the important work it is attempting to accomplish in the development of the agricultural resources of the Territory.

Questions upon subjects within the scope of the Station work will be cheerfully answered whenever possible.

Address all communications to

DIRECTOR EXPERIMENT STATION,
Tucson, Arizona.

SOMETHING ABOUT WEEDS.

BY J. W. TOUVEY.

SYNOPSIS:

I. INTRODUCTORY.

II. SOME THINGS ABOUT WEEDS IN GENERAL.

Weeds vary as to species in different localities.

Classes of weeds.

How weeds get on our farms.

The injurious qualities of weeds.

Have weeds any good qualities?

How to get rid of weeds.

United action in the destruction of weeds.

Territorial law in regard to weeds.

Local and technical names of weeds.

III. SOME OF THE MOST INJURIOUS ARIZONA WEEDS.

Cocklebur, (*Xanthium canadensis*, Mill.)

Sunflower, (*Helianthus annuus*, L.)

Ground nut, (*Cæsalpinia leucaria prinçlei*, Fisher.)

Horse nettle, (*Solanum elaeagnifolium*, Cav.)

Miasma weed, (*Verbesina encelioides*, Benth. & Hook.)

Bull mallow, (*Malva borealis*, Walm.)

Squirrel-tail grass, (*Hordeum jubatum*, L.)

Bermuda grass, (*Cynodon dactylon*, Pers.)

Russian thistle, (*Salsola tragus*, L.)

Knot grass, (*Paspalum distichum*, L.)

Nut grass, (*Cyperus esculentus*, L.)

Dock, (*Rumex berlandieri*, Meisn.)

Spiny aster, (*Aster spinosus*, Benth.)

Dodder, (*Cuscuta epithimum*, Murr.)

Johnson grass, (*Sorghum halepense*, Pers.)

IV. SOME INTRODUCED WEEDS.

V. TABLE OF FIFTY ARIZONA WEEDS.

[Thanks are due the Division of Agrostology, Department of Agriculture, Washington, D. C., for Figs. VI., VII. and X., Professor F. H. Hillman, University of Nevada, for Figs. IX. and XI. and Professor C. S. Crandall, of Colorado Experiment Station, for Fig. V. The other illustrations are from drawings by the author.]

SOME THINGS ABOUT WEEDS IN GENERAL.

INTRODUCTORY.

Some one has said that weeds are a blessing to agriculture. There may be more truth in this statement than would first appear. Clean fields are a premium that mother earth grants to decent agriculture. He who will not till his crops deserves the harvesting of tare instead of corn. As a fundamental law of agriculture, it may be stated that the abundance of weeds in any community is a fair criterion of the industry and thrift of the farming class composing that community.

The first inquiry that naturally arises in the discussion of weeds is the question, what is a weed? It is frequently defined as a troublesome plant; i. e., a plant out of its proper place, or a plant run wild. It may also be a plant that has moved in from untamed lands and found a congenial home among our cultivated crops.

A stalk of corn in a field of barley is a weed in relation to the barley, although a useful plant in its proper place. In this way quite a number of our cultivated plants occur as occasional weeds. We sometimes observe an alfalfa field broken up and put to grain; the plowing is shallow and the roots imperfectly cut, as a result we have in reality two crops in competition in the same field. Here the alfalfa is not desired and is in effect a weed. We find this two-sided aspect in many useful and ornamental plants, ordinarily valuable, but noxious when escaped from cultivation or growing where not wanted.

With us, many of our most unsightly weeds are not those decidedly injurious to our garden and field crops but a number of rank, useless plants that appear on the banks of our canals, ditches and laterals; that grow in our pastures, on uncultivated ground and along our roadsides.

Taking this view of weeds the list for this Territory numbers more than two hundred species. Of this number, however, not more than ten per cent. are sufficiently troublesome to be classed as bad weeds.

WEEDS VARY AS TO SPECIES IN DIFFERENT LOCALITIES.

A plant which is a bad weed in one locality may be almost unknown in another. To illustrate, our common tumble-weed is exceedingly abundant on the sandy soil in the upper portion of Salt River Valley, while it is almost unknown on the heavy adobe soil lower down. The sunflower and cocklebur, two of the most conspicuous and frequent of our late summer weeds, are confined mostly to the farming lands and waste places in the lower portions of the valleys and along the river courses.

The great variation in altitude between the northern and southern portions of Arizona accounts for the great differences in the weeds of these respective regions. To the north, in the vicinity of Prescott and Flagstaff, are found mullein, peppergrass, ragweed, dogbane, curled

dock and many other species common to the northern and eastern States. In the vicinity of Phoenix and farther south these weeds are unknown except occasionally on isolated ranches in the higher mountains, where they have been brought with seed purchased outside the Territory. Quite a number of our imported weeds are, however, more cosmopolitan in character and are found to a greater or less extent in all cultivated portions of the Territory. Among such weeds may be placed purslane, pigweed, and tumble-weed; weeds which are not only common to Arizona but world-wide in their distribution.

The local difference in species of weeds, or in other words, the variation as to kinds in neighboring fields, is modified largely by the character of the soil and the amount of moisture to which it is subjected. The spiny aster is only found on soil where the large underground rootstocks find considerable moisture. It may be abundant in one field and a neighboring one, at a little higher elevation, entirely free from it.

CLASSES OF WEEDS.

Weeds are either foreigners or natives; i. e., they have either been brought in during the agricultural development of the country or are indigenous plants capable of adapting themselves to civilized conditions, capable of migrating from the mesas and valleys to the cultivated fields and there reproducing themselves.

Among our weeds of foreign origin are a number of the most injurious with which we have to contend. They are usually more cosmopolitan in character than our native species, are capable of withstanding greater variations in climate and will grow upon nearly all kinds of soil. After being once introduced they usually spread with great rapidity and in a few years are more abundant than many of the native species. As illustrations of such weeds may be mentioned Johnson grass, bull mallow and purslane.

As yet we have far more species of native weeds than we have of those of foreign origin, but as the Territory becomes older in respect to agriculture many of the native species will practically disappear and their places be taken by foreign ones, which are constantly being brought in through the importation of impure seed and otherwise. Among the most injurious of our native weeds are nut grass, spiny aster, western dock, pignut, sunflower, cocklebur, horse nettle and niggerweed; while there are a half score of others nearly if not quite as injurious in special localities.

Looking at weeds from another standpoint, viz; in regard to their longevity, they may very properly be placed in three groups, totally independent, however, of the two classes already discussed. These groups are; annuals, biennals and perennials.

The first group, which includes all those which germinate, fruit and reach their maturity in one season, or in other words, those which live but one year, constitute a large majority of both our native and introduced species. As a rule, weeds of this group are not difficult to

eradicate and are comparatively harmless when proper attention is given to cultivation and when they are cut from the banks of ditches and from waste places, two or three times during the growing season. The sunflower and cocklebur are illustrations of annual weeds.

Although as a rule annual weeds are easily gotten rid of, occasionally a species fruits so abundantly and is endowed by nature with such excellent facilities for the dissemination of its seed, that it takes rank among the most injurious weeds known to agriculture. An excellent illustration of a weed of this character is seen in the Russian thistle, which, although introduced into this country a comparatively short time ago, is already the worst weed in a half dozen states in the middlewest.

We have no biennial weeds of any importance in Arizona but among the perennials are a majority of our most persistent and pernicious species. Perennial weeds are usually provided with large, strong root-systems or develop underground stems in the form of rootstocks or tubers. Johnson grass, dock, mallow, nut grass and spiny aster are representative perennial weeds. These weeds do not spread as rapidly as annual weeds, but when once established are, on account of their deep-seated roots or root-stocks, very difficult to eradicate.

HOW WEEDS GET ON OUR FARMS.

Unclean seed has more to do with the distribution of weeds than all other causes combined. As before stated, many of our worst weeds are of foreign origin. As a rule these weeds have been brought to this country in the seeds of garden and field crops. The Russian thistle was imported a score of years ago in Russian flaxseed. This pernicious weed first appeared on a single farm but now covers more than 40,000 square miles of territory. A large percentage of our alfalfa, beet, turnip, and other field and garden seeds are yearly imported from Europe. All these seeds carry with them a greater or less amount of weed seed. Our domestic seeds are by no means free from weed seed.

Farmers who raise their own seeds are not always particular in regard to purity and cleanliness. Alfalfa fields are reserved for seed that are fairly filled with Johnson grass, dock and mallow. When we purchase seed we do not scrutinize it to see if it is free from weed seed and other impurities. We plant anything that the dealer gives us and then wonder where the weeds come from. In the purchase of grain and grass seed a careful examination on the part of the purchaser ought to satisfy him as to whether it is all of the same kind at least. We should not purchase seeds that contains a half dozen sorts that we do not know. With small seeds such as alfalfa, if the finger be wet and thrust into the vessel containing them, it will be found on withdrawal to be covered with a layer of the seeds. With a small lense a very satisfactory examination can be made and all impurities detected.

Roads and railroads aid not a little in the distribution of weed seed. This is evident from the many strange plants that first make their

appearance in a community along highways and railroads. The mullein, dock and a number of other eastern weeds are at present frequent along the Atlantic and Pacific system in northern Arizona, where they have been brought by the daily trains. Railroad trains carry seeds thousands of miles and scatter them like chaff along every mile they traverse. The seeds of many pernicious weeds are emptied on our shores in ballast from foreign ships and in chaff and straw used in packing goods.

In the local distribution of weeds nature provides thousands of ways by means of which they are enabled to leave the parent plant and locate themselves in our cultivated crops. Some, like the cocklebur, ragweed and sandbur produce seeds provided with many minute hooks by means of which they fasten themselves to the hair of animals. Seeds are carried about in this way for months, but finally become detached, sometimes many miles from the place of their origin. Other seeds with a sticky outer covering as in the tarweed and in nearly all species of *Boerhaavia* are also transported by animals. The fleshy fruits of some weeds are eaten by birds and other animals; the hard seeds are not digested, but on the other hand are distributed far and wide. Seeds like those from the milkweed and spiny aster are provided with wings in the form of coma or pappus which enable them to go with the wind, to be wafted hither and thither from unkept fence row to cultivated field.

In an irrigated country the many ditches and laterals are among the most prominent agents in weed distribution. Nearly all our weed seeds are good sailors and when they reach a planted field, after their voyage down the ditch, are sufficiently moist to be in the best condition to immediately germinate and take possession of our fields.

THE INJURIOUS QUALITIES OF WEEDS.

Nobody doubts the harmful nature of weeds when left to nature, but many farmers only think of them when they appear head and shoulders above their ripening barley or when their alfalfa fields become half hidden by the ragged inflorescence of maturing dock and Johnson grass or the nodding heads of innumerable sunflowers.

Any soil, no matter how fertile, will produce only a given amount of vegetation during any given season. It lies with the farmer whether this will be a crop of weeds or of some valuable plant. Even if a part of the energy is used up in producing weeds the crop is used up to that extent; whatever is gain to the weeds is loss to the crop. Again a weedy field will take more water to produce a small crop than a well tilled field to produce an abundant one. In one of the recent bulletins of the Cornell Experiment Station the Russian thistle is spoken of as; "One of those weeds whose mission is to educate the farmer and ameliorate the soil. Weeds only prosper in fields that have been mismanaged, judicious tillage and cropping will keep them down. If the Russian thistle spreads seriously it will be because our scheme of farming makes room for it by not keeping the land in full use."

Weeds not only impoverish the soil but they shade and occupy the ground to the detriment of other plants. We are all familiar with the serious effect of spring weeds on the growth of nearly all kinds of crops produced in market gardening. How, if care is not exercised, they choke the slender onions, just from the seed, and cause the young beets and parsnips to become pale and worthless.

Weeds are hardy plants and in their struggle for existence, unless checked, force to the wall the more tender plants which it is man's province to grow and cultivate.

Many weeds aid in the dissemination of fungus diseases. Rootrot, one of the most injurious plant diseases of Arizona is largely spread by the scattering of spores, which correspond to seeds in higher plants. Infested weeds aid the spores in making their way from tree to tree or from one cultivated plant to another.

Some weeds are injurious to stock. Our common squirrel-tail grass, abundant in soils impregnated with alkali, frequently causes serious injury to sheep and other stock. If the heads of this grass are eaten when dry, the hard, sharp awns not infrequently penetrate the mucus membrane of the mouth and cause dangerous ulcers.

A number of plants indigenous to Arizona, mostly belonging to the genus *Astragalus*, are known as loco weeds from the peculiar effect that they have when eaten upon nearly all kinds of stock. At various times much discussion has arisen as to the poisonous principle found in these weeds. Many experiments have been made and extended investigations carried on but the results have been conflicting. Decoctions, made from them, have been fed to animals and men have chewed the weeds without any apparent effect; again, stock have been fed on the plants and evidently died from the result. Locoed cattle are not uncommon in Arizona and it is the universal opinion among cattlemen that these weeds are the cause of the disease.

Cocklebur, ragweed and a number of other common weeds are detrimental to stock when they form tangled masses of burs in their hair. More especially are they harmful to sheep by getting into the wool and depreciating the value. They injure horses by getting into the manes and tails and making it necessary to disfigure the animals in order to get rid of the burs.

HAVE WEEDS ANY GOOD QUALITIES.

In a direct sense weeds have few good qualities; some, however, are of more or less value as forage, but from the fact of their growing in crops under cultivation they can seldom be utilized as such. One of our worst weeds, viz: Johnson grass, is not infrequently grown for hay, but when so grown is in its proper place and cannot be considered a weed. A number of our annual weeds such as purslane and wild oats are excellent forage for certain classes of stock but not of sufficient value to warrant the gathering from their scattering positions in our cultivated fields for the sole purpose of utilizing as forage.

All plants are of more or less value as fertilizers when plowed under or allowed to decompose on the ground, hence weeds if treated in this manner return some value to the soil. In an arid country, however, but little value is returned to the soil from this source as weeds when matured or cut down do not decay but become dry and blow about scattering their seeds here and there, until finally brought to a halt in some fence row or in the arms of some spreading bush in a neighboring, unused field. Weeds have an indirect value in teaching more thorough methods of cultivation.

HOW TO GET RID OF WEEDS.

The cultivator and hoe manned by a pair of strong, industrious arms are the best antidotes for weeds. How much harm do weeds do in the orchard which is in the proper state of tith and cultivation? How much harm do weeds do in an alfalfa patch or barley field that has been properly plowed and harrowed and sown with good clean seed? The dearth of weeds in such places is the premium for proper, decent cultivation. Weeds as a rule are only harmful to poor agriculture, a penalty which many farmers have to pay for their late breakfasts and general lack of industry.

The value of the crop obtained by thorough cultivation does not accrue entirely from killing the weeds. The hoe and cultivator uproot the weeds but in so doing they loosen the soil, make it much more retentive of moisture and better adapted to the growth of plants. There is no royal road to the destruction of weeds. It means an earnest and energetic campaign carried on by the farmer from the beginning to the end of the season. The best recipe, when a weed appears on our farm, is to shoulder our hoe and go after it, for the only way to get rid of it that is yet known to humanity is to hoe it out or pull it up, root, branch and stem.

Some agriculturists have advised putting salt, kerosine oil, blue vitrol and other chemicals on weeds in order to kill them. All these remedies are ordinarily impracticable. A well managed hoe and a good cultivator kept on the go will do more to discourage weeds and keep crops moving than all the chemicals in creation.

So much for weeds when they take up their residence on our farms. They are bad company and the sooner we get rid of them the better. The diplomat, however, is he who keeps them from coming.

In a new country, where there is so much waste and uncultivated land and so many irrigation ditches, it is a little discouraging to the thrifty farmer to see the thistle-down and milkweed seed waft with every breeze from his neighbor's field, over his barbed wire fence, into his own; or to see the seeds of Johnson grass and sunflowers float lazily on the surface of his ditches and every time he irrigates spread themselves over the surface of his entire farm. With us, weed seeds, in a large measure come from the rank growth of weeds which usually decorate both sides of the main ditches and lateral, a half dozen or more miles

above our farms. As a practical illustration, some one a few years ago drew a load of hay made from Johnson grass along one of the ditches in the upper part of Salt River Valley. The next year a number of patches of this grass decorated, here and there, the banks of the ditch. Ever since, its waters have been bringing down cargoes of Johnson grass seed and doling them out to the farmers below, free of charge. The farmer sees a small patch of grass in one corner of his orchard, he takes his hoe and undertakes to dig it out. The next month he finds the patch as green as ever, he hoes it again and deceives himself in thinking that he has hoed it out. By the end of the season if he has been tolerable persistent, so far as persistence goes, he finds that it is not more than two or three times as large as when he first began to tamper with it. Here is a case where the hoe is not an antidote, but it is only apparently so. If it be kept going every week during the growing season the weeds cannot survive. No plant of this character will keep alive for an entire season without the privilege of developing at least a few green leaves. Roots and rootstocks cannot persist indefinitely independent of stems and leaves. Keep this plant below the surface of the ground and the roots will eventually die.

For the complete eradication of a noxious plant, the production of seeds must be prevented and if the plant be a perennial the rootstocks must be killed. The process by which weed seeds may be prevented from maturing and the process by which rootstocks may be killed are in most cases simple and in no case impracticable. It seems, therefore, that with reasonable fidelity and faith in the hoe and cultivator some of these so-called enemies to agriculture might be completely eradicated, or at least so held in check that their injury to cultivated crops be brought down to a minimum.

In general, annual weeds, or weeds like the sunflower and cocklebur, may be destroyed by mowing prior to seed production. Abundant crops of annual weeds are matured every fall in our potato patches and stubble fields. It is far better that a profitable fall crop occupy the ground than it be grown over to a rank growth of annual weeds, useless to ourselves and vexatious to our neighbors; if not so occupied, it is a duty we owe to ourselves and the community that such weeds be not allowed to go to seed.

Many perennials not only reproduce themselves by seed but are largely propagated by some form of underground stem or rootstock, hence it is not only necessary to prevent seed production but the underground stems must be destroyed.

How to kill these underground stems at the least expense, is of considerable importance. In general the following principles apply.

1. The rootstocks may be dug up and removed, a remedy that can be practically applied on small areas only.
2. Rootstocks may be starved to death by preventing the development of green leaves or other parts above ground. This may be effected in several ways, depending upon the ingenuity of the farmer. If con-

venient, straw stacks may be built over small, persistent patches. If scattered over the field; continuous, thorough cultivation is necessary. If growing on waste places the hoe or spade will need be brought to use.

3. The plants may sometimes be smothered by growing some crop that will exclude the light.

4. Rootstocks are readily destroyed by exposing them to the direct action of the sun during the summer drought; hence plowing during the dry season may be effective.

5. Any cultivation which merely breaks up the rootstocks and leaves them in the ground, especially during wet weather, aids in their distribution and multiplication, and is worse than useless, unless cultivation be continued so as to prevent growth above the ground. Plowing and fitting ground in early spring and cultivating at intervals until the latter part of summer, then leaving the land uncultivated during the remainder of the season, is one of the best methods that could be pursued to encourage the growth of Johnson grass and many other perennial weeds.

UNITED ACTION IN THE DESTRUCTION OF WEEDS.

In cases where weeds have become abundant and widely distributed the conditions under which many of them occur are so varied that we can only hope for their reduction to a state of comparative harmlessness. When a weed becomes so wide spread that it is the first thing to greet us when we step out of doors in the early morning, or is continually nodding to us over the purple bloom of our alfalfa fields, concerted action is absolutely necessary to hold it in check. Such weeds not only contaminate our cultivated fields but if eliminated from them, hide in the fence rows, among the brambles of uncultivated fields, along the banks of ditches, or in hundreds of other places where it seems to be nobody's business to disturb them. Weeds are usually thrifty plants that generally turn their first attention to the production of seeds. Not only this but many produce seeds equipped with minute wings, by means of which they waft away a mile or more from the unkept fence row and plant themselves squarely at our door. Others are good sailors satisfied to leave the banks of a foul ditch and take up their abode under our fig tree.

There are at least two weeds in Arizona, viz: Johnson grass and bull mallow, that demand concerted action. Theoretically the best way to get this united action is for each individual to do his duty. Legislative action will materially help Territorial interests by passing laws that require road sides, waste fields and banks of ditches be kept free from our worst perennial weeds. A law relating to this subject, with an efficient officer responsible for its execution, should in a short time greatly improve the appearance of our farms, road sides and ditches.

ARIZONA LAWS IN REGARD TO WEEDS.

Arizona already has incorporated in her statutes a laws in relation to cockleburrs and sunflowers, but as the law does not provide any special means for its enforcement it is practically inoperative. If the farmers desire united action in order to hold in check our worst weeds, a law may be obtained through legislative enactment compelling the destruction of such weeds. No law, however, will be of any value unless the farmers are united in its support and in seeing that it is enforced. I quote below the territorial law in regard to weeds.

COCKLEBURRS AND SUNFLOWERS.

Section 1. That all owners or operators of irrigating canals be required to remove from the banks of their canals all cockleburrs and sunflowers growing thereon and remove the same before they ripen and mature seed, and all irrigating canal owners or operators who shall fail to remove the same from the banks of their canals or irrigating ditches, shall be fined upon conviction for the first offense the sum of ten dollars (\$10) and for the second offense the sum of fifty dollars (\$50) and for the third offense the sum of one hundred dollars (\$100) and costs, and for all subsequent offenses the sum of one hundred dollars (\$100) and costs, all such fines to be paid into the public school fund.

Sec. 2. This act to take effect in sixty days from the date of its passage.

Approved April 3, 1893.

(Laws of Arizona, 1893, No. 33.)

LOCAL AND TECHNICAL NAMES OF WEEDS.

In discussing weeds care must be exercised in regard to common and local names. In a single locality a weed may be known throughout the community under one name, or, as is much more likely, several names may be used by different persons to designate the same plant. Again, two or more weeds somewhat alike in appearance may be known under the same name. In different localities the same name is sometimes applied to weeds of widely different character, or, as in some instances, each locality may have different names for the same thing: As a result, there is much confusion in common and local names, making it necessary to use technical names in conjunction with them, even in popular descriptions.

No effort has been made to describe technically any of the weeds discussed, but from the illustrations given and the account of their habits it is hoped that all may be readily identified. Individual remedies are not devised for each species. The reason for this lies in the fact that proper cultivation is the only way to get rid of weeds after they are once with us.

SOME OF THE MORE INJURIOUS ARIZONA WEEDS.

SUNFLOWER, *Helianthus annuus*, L.

To the people of Arizona this weed requires no introduction. It is a weed which waits until we harvest our crops and then steps in and takes possession of our fields. It will not stand being disturbed by cultivator or hoe, hence we seldom see it in fields under thorough cultivation. It is preeminently a weed of our fence corners, roadside and ditches where our present agricultural methods do not disturb it; and where it matures seed each year to scatter over our grain fields. From its recognized home in our fence corners, etc., it encroaches on our fields until in many cases it drives the cultivated crops out and appears head and shoulders above everything else in the neighborhood. Single plants frequently grow to the height of twelve feet, the many branches covered with innumerable nodding heads of yellow and brown. This plant, seeds abundantly and almost any time during the fall and winter the brown seeds may be seen on the surface of our ditches on the way to our fields.

We would experience no difficulty in getting rid of this unsightly annual if each farmer would do his duty and see that it be killed each season before going to seed. So far as ditches and roadsides are concerned, the law in regard to sunflowers and cockleburrs, already in the statutes of Arizona, should be enforced. It is the farmers' fault that this law is inoperative.

NUT GRASS. *Cyperus esculentus*, L.

Other names: Chmfa; galingale; sedge.

This so-called grass, a species of cyperus or sedge, is on account of its numerous tubers one of the most difficult weeds to eradicate in southern Arizona. It is a plant of wide distribution, growing in moist places throughout the United States, also in Mexico, South America, Europe and Australia.

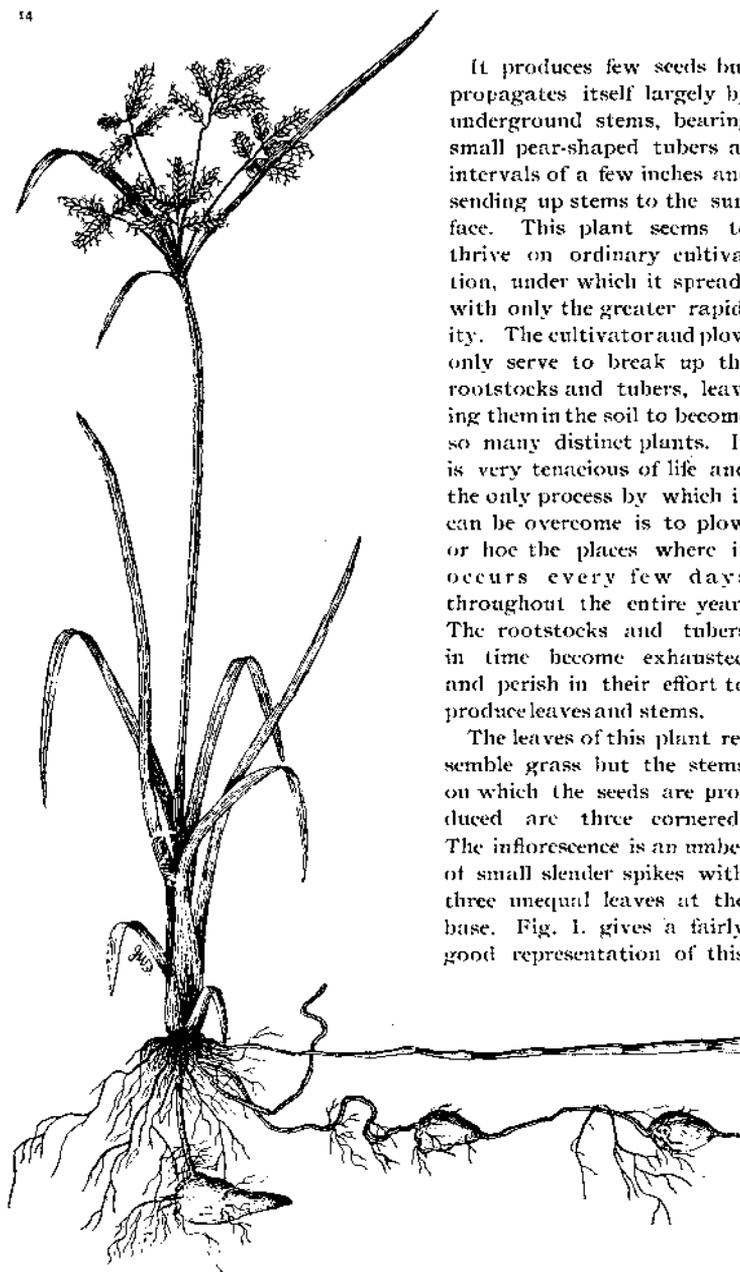


Fig. 1.—Nut Grass [*Cyperus esculentus*, L.]

It produces few seeds but propagates itself largely by underground stems, bearing small pear-shaped tubers at intervals of a few inches and sending up stems to the surface. This plant seems to thrive on ordinary cultivation, under which it spreads with only the greater rapidity. The cultivator and plow only serve to break up the rootstocks and tubers, leaving them in the soil to become so many distinct plants. It is very tenacious of life and the only process by which it can be overcome is to plow or hoe the places where it occurs every few days throughout the entire year. The rootstocks and tubers in time become exhausted and perish in their effort to produce leaves and stems.

The leaves of this plant resemble grass but the stems on which the seeds are produced are three cornered. The inflorescence is an umbel of small slender spikes with three unequal leaves at the base. Fig. 1. gives a fairly good representation of this

plant. In Arizona it is most troublesome along our ditches. It will not thrive where it cannot get an abundance of water; hence there is little danger that it will become troublesome elsewhere. It is now one of the worst ditch weeds that we have and each season it is becoming more widely extended. Our farmers do not appreciate the great loss of water incurred by our ditches becoming filled with the so-called ditch weeds, among which the nut grass is one of the most abundant.

GROUND NUT. *Caesalpinia falcaria pringlei*, Fisher.

Other names: Wild potato; pignut.

This plant is indigenous to Arizona and is frequent throughout all the valleys in the southern portion of the Territory. It is not a large or conspicuous weed but the persistency with which it maintains itself, after once well established, places it among the worst weeds to eradicate that we have.

Its greatest growth occurs in the fall, after the summer rains; there is, however, scarcely a month in the year that it may not be found either in flower or in fruit. Its appearance above ground is rather harmless, but it develops deep seated tubers, many of which are below the reach of the plow.

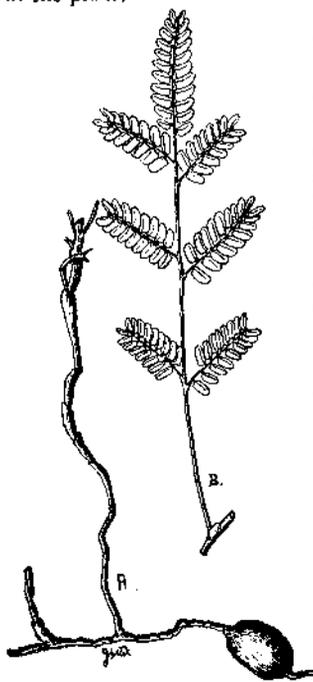


Fig. II.—Ground nut. [*Caesalpinia falcaria pringlei*, Fisher.] A, rootstock showing tuber. B, one of the compound leaves.

These tubers are about an inch in length with something more than half that in diameter. Under favorable conditions they increase with wonderful rapidity and fairly fill the soil. A little later each tuber sends to the surface a long, slender, wiry stem, which on reaching sunlight puts forth a few leaves as illustrated in Fig. II. and finally a slender raceme of a half dozen or more yellow flowers, more or less covered with sticky, glandular hairs.

Seeds are seldom produced, as the plant perpetuates itself largely by its underground tubers. The few fruits which mature consist of small curved pods a half inch or more in length, containing from four to six small beans.

It usually becomes more abundant when land is brought under cultivation. This arises from the fact that the plow does not disturb the tubers and the tops are not cut frequently enough to prevent their development. It is most abundant in heavy adobe soil and is not averse to soil impregnated with alkali.

Ditch banks, recently thrown up, and roadsides, plowed and left undis-

turbed are usually soon covered with this plant; plowing only increases the growth and aids it in spreading, hence its rapid increase in fields is largely due to plowing and then leaving the fields in a poor state of cultivation.

The depth of the tubers makes it impracticable to get rid of them by digging, and again their small size and brownish color render them exceedingly difficult to find. If the tops be cut to the ground every few days or as often as they appear, the tubers will finally die.

HORSE NETTLE. *Solanum elaeagnifolium*, Cav.

Other names: Prickly nightshade; bull nettle; trompillo.

The mature fruit of this weed is illustrated in Fig. III. It is a widespread indigenous weed found throughout our entire arid belt, infesting both plains and valleys. When wild land is brought under cultivation it frequently becomes, for a year or two, a very aggressive weed. This condition being a result of its deep seated rootstocks which enables it to maintain itself year after year although the top dies to the ground at the close of each season's growth. When land is broken up for the first time our farmers should make a special effort to dig out all the rootstocks. If this be thoroughly done in the beginning but little trouble will be experienced from this weed among our cultivated crops.

The plant is quite conspicuous, its flowers reminding one very much of the flowers of the cultivated potato. The fruits at maturity are rather large, yellow berries, one-half inch in diameter, which turn black with age, and are filled with small flat seeds. The leaves and stems are silvery white and covered with multitudes of branched hairs, with now and then a strong yellowish-brown prickle. It will grow and develop

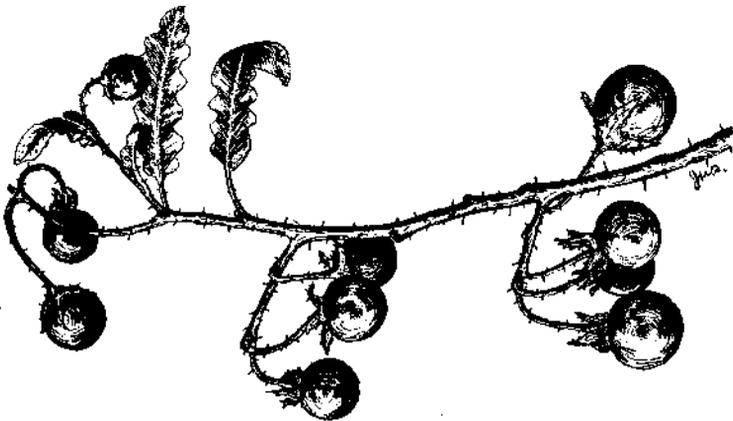


Fig. III.—Horse nettle. [*Solanum elaeagnifolium*, Cav.]

fruit our driest seasons, on land not under irrigation. If the weed be not

subdued, it develops as if by magic, forming large patches of thorny weeds, from one to two and one-half feet in height.

We have several other less aggressive weeds known as ground cherries which are more or less closely related to the above and which produce flowers of the same form. The creeping ground cherry (*Physalis lobata*, Torr.) is a low growing perennial, abundant in many of our cultivated fields. It may be found at any time during summer and fall, its slender stems lying flat on the ground and producing at the axils of the leaves, small, violet flowers. The fruit is a berry somewhat similar to that of the horse nettle with the exception that it is encased in a loose sac, formed from the enlarged calyx. The leaves and stems are covered with short hairs with correspondingly large, white knobs at the summit, giving the plant, on close inspection, a peculiar, scurfy appearance. The long, slender rootstocks render it nearly as difficult to eradicate as the horse nettle.

From our orchard in Salt River Valley, the tall ground cherry (*Physalis angulata*, L.) was reported as the worst weed. This is a tall, spreading, loose growing annual that ought to become discouraged at the first indication of proper cultivation. The fruit is very similar to that of the last species and the flowers only differ in that they are white.

BULL MALLOW. *Malva borealis*, Wallm.

Other names: Clocks; cheeses.

There are but few weeds in Arizona more difficult to eradicate than the bull mallow. It is one of the most abundant species of our roadsides, barn yards and bits of waste land about farm buildings.

A young plant a few inches in height and a mature fruit are illustrated in Fig. IV. It does little harm in cultivated fields but rapidly crowds its way from roadsides and fencerows into pastures and alfalfa fields. Sometimes half the product of the field being this obnoxious weed. Ordinarily the plant is from six to eighteen inches in height, but occasionally a single plant reaches a height of four or five feet and covers an area of a dozen square feet.

It is a perennial, having a long, strong tap root extending two or more feet into the ground. It may be readily known by its heart shaped leaves with lobed and undulate margin, and its peculiar circular, flat fruits which break up at maturity into about a dozen sections each containing one seed.

Cutting, two or three times during the year, will have little effect on its spread and growth. In order to eradicate it, it is necessary to bring into use a spade or sharp hoe, that it may be cut below the crown, or in other words, two or three inches below the surface. If this be thoroughly done and the plants turned crown upward to the sun they may be completely eliminated from a given area with a single effort. In

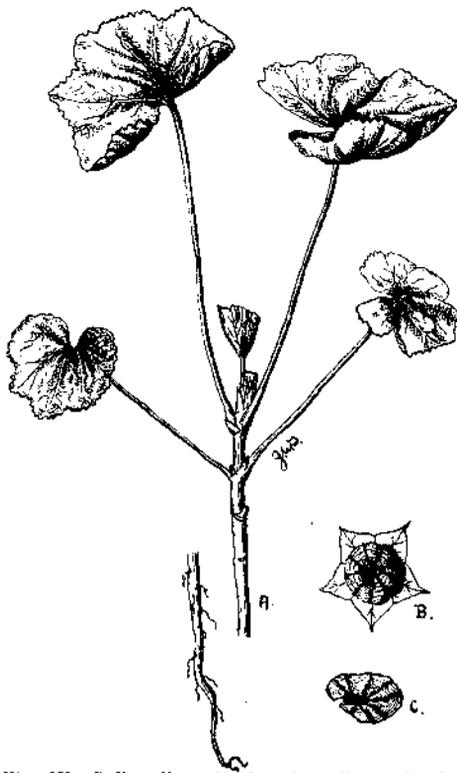


Fig. IV—Bull mallow [*Malva borealis*, Wallm.] A, strong perennial roots; B, Mature fruit; C, Section of fruit. Seedling plant. are not destroyed when land comes under cultivation. It is by no means as serious a pest as the bull mallow, as it readily submits to proper cultivation.

RUSSIAN THISTLE. (*Salsola tragus*, L.)

Other names: Russian cactus; saltwort; tartar weed.

There is no direct evidence that this weed has as yet found its way into Arizona. A number of letters have been received, however, from various portions of the Territory making inquiries in regard to it. It is, therefore, thought best to incorporate a brief description and figure of the plant in this bulletin.

A plant supposed by the senders to be this weed has been received from Verde Valley and Prescott but in each case it proved to be the Star thistle (*Centaurea melitensis*, L.)

One of the October numbers of the *Philadelphia Ledger* contained the following statement: "Russian thistles, a patch of which has flourished for some time near Whipple, Arizona, have overgrown well trodden paths there and made them impassible either for man or animals."

order to get rid of this weed by mowing, it is necessary to cut it every week or ten days for two or three consecutive seasons.

The nigger weed is closely related to the bull mallow and should receive a word in this connection. In this plant the leaves are about three-fourths of an inch in diameter, and the flower has something the shape of a miniature Holly hock. The fruit is more spherical than the bull mallow and each of the ten or twelve segments, into which it separates at maturity, contain two seeds instead of one.

The abundance of this weed is largely due to the fact that the

Our efforts so far have failed to corroborate the above statement. Considerable effort has been made to obtain specimens from every locality, where a rumor of its presence has come to notice, but to date not a single authentic specimen has been received. This does not prove that it does not occur in Arizona. It is not at all improbable that it may be found in the northern part of the Territory as it is growing in considerable abundance in nearly all the surrounding states and in New Mexico.

The plant grows, when it has sufficient room, in the form of an immense tumble weed only assuming an upright position when crowded among other plants. It is a rapidly growing annual with a dull, white

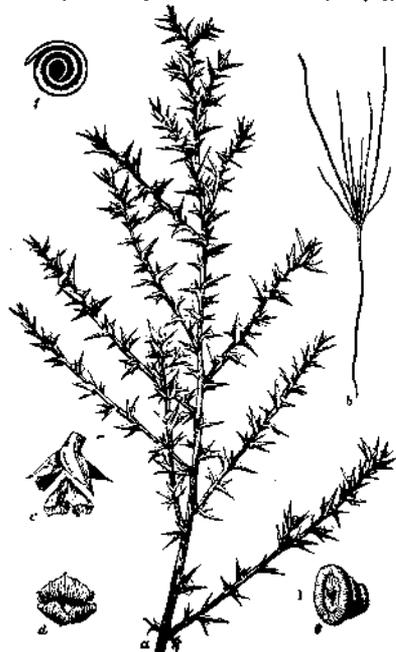


Fig. V.—Russian thistle. [*Salsola tragus*, L.] A, branch of plant; B, seedling; C, flower showing floral bracts; D, flower; E, mature fruit; F, embryo.

tap root, twisted near the crown. The leaves are small and succulent with a long spine at the summit. The flowers are small and inconspicuous, about five-twelfths of an inch in diameter and each flower produces a single seed inclosed in a thin seed coat.

The illustrations in Fig. V. are sufficient to enable one to identify this troublesome pest. Wherever this plant becomes established it excludes all other plants and draws very heavily on the fertility of the soil. Being a rather fragile succulent annual, it is not especially injurious to cultivated crops but works the greatest disaster amongst wheat, barley, oats and similar crops and where it not infrequently ruins the crop.

The farmers of Arizona should be on the watch for this weed and see that it be destroyed on its first appearance, for if it become thoroughly established it can only be overcome by an enormous outlay of labor.

This Station would be grateful to any person finding this weed in Arizona to report it and send specimens for identification. The fundamental principle in combating it is to prevent seed production.

COCKLEBUR. (*Xanthius canadensis*, Mill.)

Like the sunflower, the cocklebur requires no introduction. There is scarcely a field of waste ground in southern Arizona, where moisture is sufficient, in which it does not luxuriate. It is a large, coarse, rough-

leaved annual that matures in October and at this time becomes one of the most unsightly weeds that we have. It does not appear until after the summer rains, but from this time until the end of the season it grows with wonderful rapidity and takes full possession of thousands of acres of our waste lands. In such places it forms a dense growth two to four feet high covered with innumerable burs, bearing strong, hooked spines which enable them to catch to the hair of passing animals and become scattered far and wide. This is a common weed in our pastures where it causes not a little damage to horses and sheep.

The seeds are disseminated largely over waste ground on the surface of flood water, and reaches our cultivated fields and pastures through irrigating ditches. It is never found on lands which are in a proper state of cultivation and like the sunflower, where found in abundance, is one of the signs of poor husbandry.

If attention be given to have these plants cut before seeds are matured, for two or three consecutive seasons, little trouble will be experienced from them and the unsightly appearance of much of our waste lands be avoided.

SQUIRREL-TAIL GRASS. (*Hordum jubatum*, L.)

This grass is found in considerable abundance on moist soils impregnated with alkali. It is not discussed here so much on account of its detriment to agricultural crops as because of its injurious effect on nearly all classes of live-stock when eaten. It is the most common of our wild barleys, being distributed over large areas of both the eastern and western continents. Its numerous, long, stiff, sharp and strongly barbed awns or beards are its most distinguished characteristics. Chemical analysis shows this grass to have considerable nutritive value as forage, but its harmful nature has relegated it to the rank of a weed.

In the upper portion of Salt River Valley it is found in abundance where the seed is annually disseminated by water, wind and animals. It thrives best where it can get plenty of water, hence is most likely to occur along ditches and in fields where there has been over-irrigation. As it grows in compact bunches six to eighteen inches in height, the numerous fragile spikelets bearing long, shiny awns makes it very conspicuous.

While young this grass may be eaten by all classes of stock with perfect safety but when the beards mature and the awns become fully developed its harmful nature is apparent. If, at this time, it be eaten by stock, when taken into the mouth the beards break up into many pieces and the barbed awns pierce the mucus membrane, making their way through the flesh, inducing inflammation. If the cause be continued, suppuration of the gums occur and later ulceration of the jaw bones.

From a humane standpoint this grass should be eradicated from pastures, alfalfa fields and other places where it may be eaten by stock or made into hay. As it is an annual, if reasonable care be exercised to prevent its maturing seed, it can be readily exterminated.

BERMUDA GRASS. (*Cynodon dactylon*, Pers.)

Other names: Reed grass; wire grass.

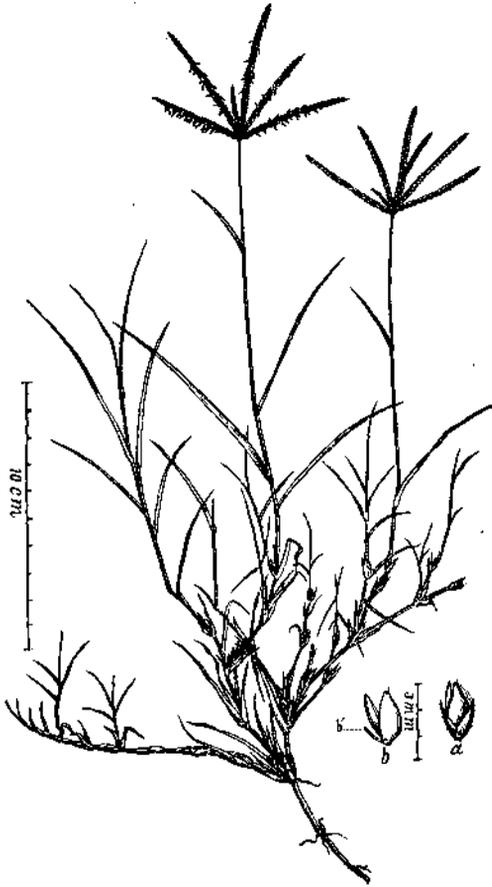


Fig. VI. --Bermuda grass. [*Cynodon dactylon*, Pers.]

This grass is used quite extensively in Arizona in the making of lawns, but from the creeping habit of its long, wiry stems it becomes obnoxious in gardens and occasionally on the banks of ditches. In our climate it seeds abundantly and there is danger that it may in time become much more harmful than it is at present. It is exceedingly difficult to eradicate and when once thoroughly established can only be overcome by withdrawing all irrigation water for an entire season. The illustration show in Fig. VI. shows sufficiently well the appearance and habit of this plant without further description.

KNOT GRASS. (*Paspalum distichum*, L.)

Other names: Joint grass; false Bermuda grass; ditch grass.

The so-called false Bermuda grass or joint grass is the most widespread of our ditch grasses. It is found more or less everywhere where there are ditches. It is not as strong and robust as the Johnson grass but



produces the same kind of underground stems or rootstocks which penetrate the soil in every direction. These rootstocks are small, hard, wiry stems which produce roots at the joints and send small stems to the surface. Other stems, sometimes six feet in length, creep over the surface in the fashion of Bermuda grass, striking root at the joints and covering the ground with a complete mat of wiry stems. The flowering stems are small and slender, bearing two or three slender spikes, a little longer than those of the Bermuda grass. The illustrations in Fig. VII. are from a closely related Joint grass (*Paspalum platycaule*) but sufficiently similar to the plant under discussion, to serve for identification.

Like the nut grass this weed can only be exterminated by hoeing every time the leaves show above the surface. Half way measures

Fig. VII—Joint grass. [*Paspalum platycaule*, Poir.]

will be of no value, as it is necessary to entirely prevent the development of stems and leaves above ground.

MIASMA WEED. (*Verbesina encelioides*, Benth. and Hook.)

Other names: Sore-eye weed; yellow daisy.

There is probably no weed of wider distribution through Arizona than this annual which grows to the height of one and one-half to three feet. It has a disagreeable, nauseating odor which makes its presence known to one passing through a field infested with it. This characteristic very likely accounts for the common names under which it is known. There is a general belief that when it grows in abundance it is productive of malaria and similar diseases; also, that when it comes in con-

tact with the face it causes inflammation of the eyes. I am unable to state why these opinions should exist. I have handled the plant repeatedly without any ill effect whatever and see no reason for considering it dangerous in any way to man or beast.

It is a rather showy plant appearing after the summer rains, not only in our fields and on waste land, but over thousands of square miles of open plateau and mesa. The leaves are light green and covered with soft, appressed hairs. Branching abundantly from the base, the long stems bear many nodding heads of yellow flowers, something after the fashion of small sunflowers. Although the plant is with us in great abundance it is not difficult to eradicate. Thorough cultivation for a single season will completely exterminate it from the most badly infested fields. It is an unsightly, disagreeable weed on waste land and along roadsides and should be mowed from such places during the month of September.

DOCK. (*Rumex berlandieri*, Meisn.)

Among the three or four species of dock indigenous to Arizona the one here discussed is most injurious to agriculture. It has a long, strong taproot which endures year after year, rendering it quite difficult to eradicate. In habit of growth it is erect, usually growing a single reddish stem two or four feet in height, bearing a panicle of small flowers, and at maturity many small triangular fruits.

Fig. VIII. represents a branch of this weed, a small fruit, the long taproot and one of the three reticulated valves which inclose each fruit.

Like many other of our perennials this plant is most abundant in neglected fields, pastures and meadows. As with the bull mallow it leaves our poorly kept fence rows and ditch banks and creeps into our alfalfa fields and pastures; gradually crowding the alfalfa toward the center of the field until it finally holds undisputed sway over the entire field.

A little persistency on the part of the farmer should overcome this weed and keep it out of his fields. Like the mallow, if it be cut below the crown and the top with the small piece of attached root thrown to one side, no further trouble will be experienced from it.

Unlike the ground nut, Johnson grass, and other weeds with roots, tocks or tubers, this plant may be entirely destroyed at one operation, if care be taken to cut all plants below the crown.

It seeds profusely, the small buck-wheat shaped fruits floating on the surface of our ditches and then over our fields when we irrigate. It will only thrive where it gets considerable water, hence is only found as a bad weed in our alfalfa fields, occasionally along our



Fig. VIII.—Dock. [*Rumex berlandieri*, Meisn.] A, taproot; B, fruit; C, one of three valves enclosing each fruit; D, flowering branch and leaf of plant.

DODDER. (*Cuscuta epithimum*, Murr.)

Other names: Tangle vine.

Dodder is a slender, twining, yellow vine, parasitic on alfalfa as well as many other plants both cultivated and wild. We have several native and introduced species in Arizona, but the one designated above, an emigrant from Europe, causes the greatest harm to our alfalfa fields.

It is a slender annual entirely destitute of leaves, its orange yellow stems climbing over the host, making a marked contrast with the deep green and purple of the alfalfa. Unable to provide for itself by utilizing the plant food in the soil it depends upon some other plant for its support.

As the seed germinates it puts forth a slender stem which soon comes in contact with the alfalfa if it be sufficiently near. Small suckers are developed which penetrate the tissue of the alfalfa and from that time on it draws its support from its host.

When it occurs in considerable quantity it greatly lessens the value of the pasturage, and hay made from infested alfalfa is almost valueless, once established, the yellow thread-like stems extend from plant to plant with considerable rapidity. Infested patches are easily seen and

ditches and road sides and on lands where the water comes within a few feet of the surface.

There are probably no weeds more universally known or more wide-spread than the many and varied species of dock, one or more of which are found in every state in the Union. The yellow dock, a species introduced from Europe and which for many years has been a bad weed in the eastern states, is growing to some extent in northern Arizona. Canigre, a species indigenous to this Territory is a weed in not a few of our southern

probably the best method to get rid of them is to mow and burn, care being taken to mow close to the ground and to burn over the entire infested area.

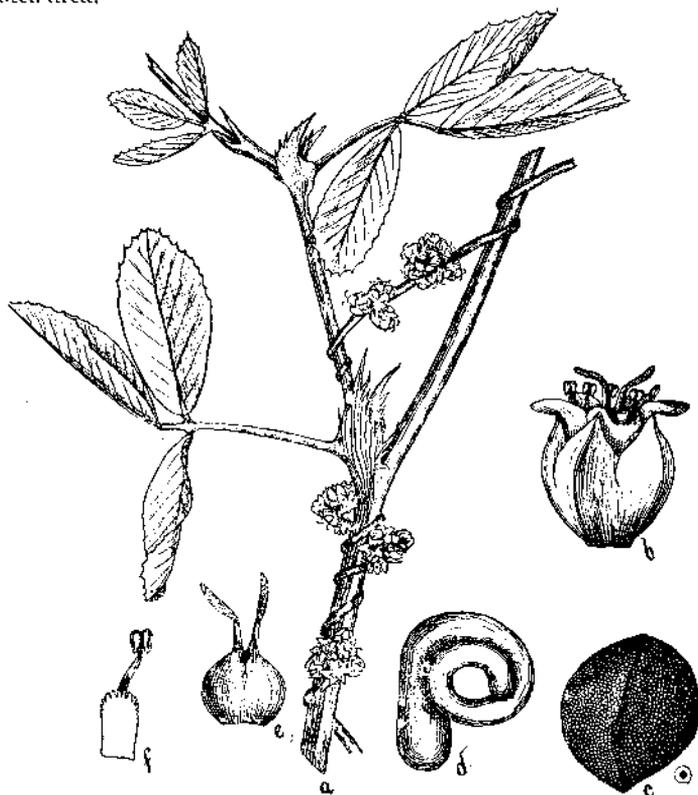


Fig. IX.—Dodder [*Cuscuta epithimum*.] A, stem of alfalfa bearing the twining stem of *C. epithimum* with its cluster of flowers; b, an isolated flower; c, a mature seed; d, the embryo; e, ovary showing characteristic stigmas; f, a stamen with its scale.

As with most other weeds it is far easier to prevent its coming than to combat it when once with us. Dodder reaches our alfalfa fields through the sowing of impure seed. As expressed elsewhere, it is of great importance that more attention be given to the seeds we sow. Dodder seed are much smaller than alfalfa seed and instead of being smooth are minutely dotted as may be readily seen by examining under a hand magnifier.

JOHNSON GRASS. (*Sorghum halepense*, Pers.)

Other names: Mean's grass; Cuba grass

It is not worth while to enter into a lengthy description of Johnson grass, as a majority of the farmers of Arizona are thoroughly familiar with it, many of them more so than they would desire.

The tall, strong stems bearing wide-spreading panicles are only two numerous throughout the irrigated regions of this Territory. This grass was brought to Arizona some half score years ago, by one of our farmers anxious to experiment with a new forage plant. Since that time it has been traveling over our irrigated regions until it is now established pretty much everywhere. When once established it hangs on with wonderful persistency. As expressed by one of our farmers:

"Early this spring I observed a small patch in the corner of my orchard and immediately sent a man to dig it out. That patch has been dug out four times this season and it is now about three times as large as when I first began to tamper with it."

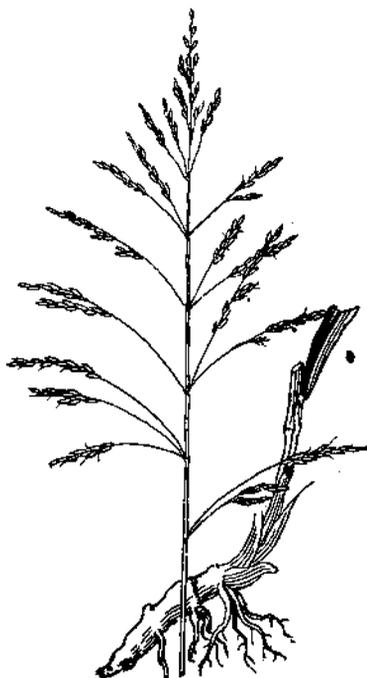


Fig. X. - Johnson grass. [*Sorghum halepense*.]

The large rootstocks represented in Fig. X. make their way through the soil with great rapidity and frequently penetrate to considerable depth. Those who have tried exterminating with this plant by digging, appreciate the difficulty of getting the rootstocks out at one operation. There will invariably remain enough to bring the grass up nearly as thick as ever in a few weeks time. A small patch may be gotten rid of, however, by thorough hoeing, if sufficient perseverance be shown. Instead of hoeing three or four times during the season, every time a few leaves appear above ground it is absolutely necessary to repeat the operation. The expense incurred in digging out large areas renders this method impracticable. Winter plowing, harrowing and the withholding of water has been effective in some instances. Sometimes we may take advantage of small areas by building haystacks and the like over them and smothering them out.

This grass is largely disseminated by seeds floating over our fields when we irrigate; hence the necessity of keeping it from maturing seed on the banks of our canals, main ditches and laterals.

SPINY ASTER. (*Aster spinosus*, Benth.)

Other names: Skeleton weed; scoba.

The spiny aster is a characteristic weed along our river and washes where it forms tangled masses of thorny vegetation miles in extent.

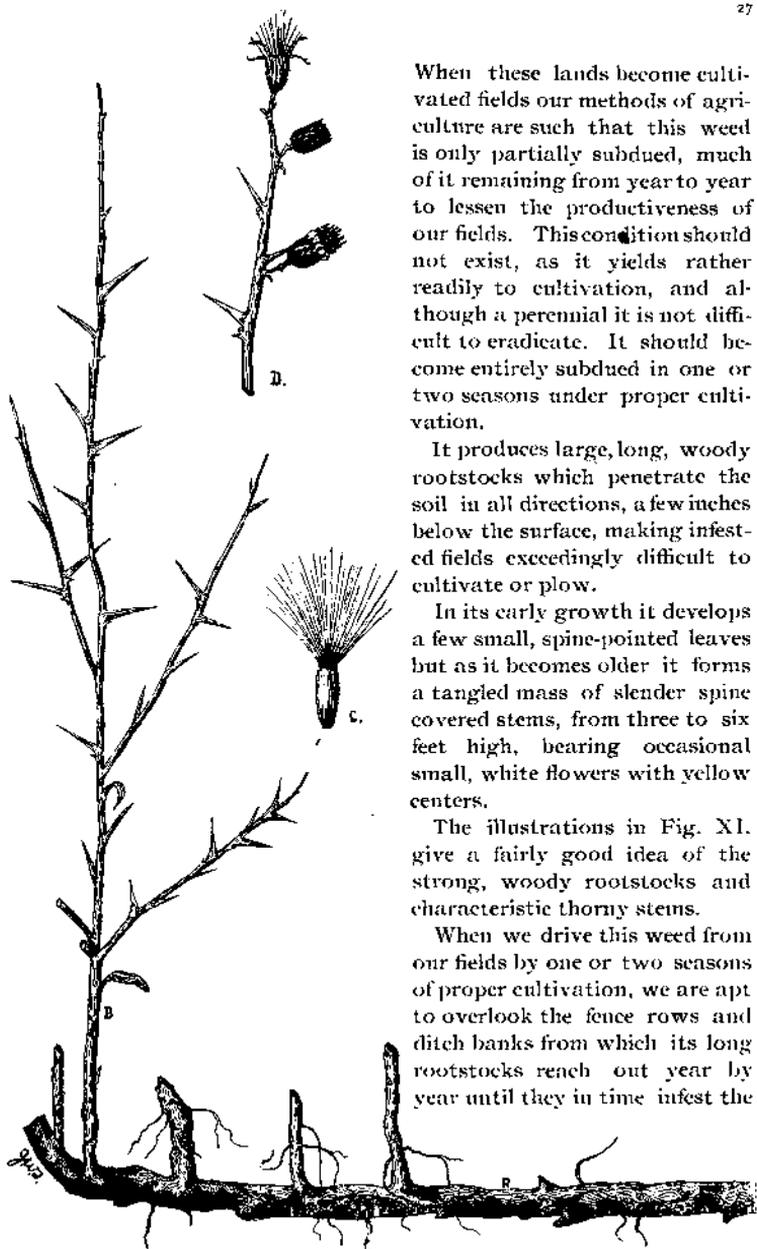


Fig. XI. Spiny aster.—*Aster spinosus*, A, rootstock; B, young stem; C, fruit; D, flowering branch.

When these lands become cultivated fields our methods of agriculture are such that this weed is only partially subdued, much of it remaining from year to year to lessen the productiveness of our fields. This condition should not exist, as it yields rather readily to cultivation, and although a perennial it is not difficult to eradicate. It should become entirely subdued in one or two seasons under proper cultivation.

It produces large, long, woody rootstocks which penetrate the soil in all directions, a few inches below the surface, making infested fields exceedingly difficult to cultivate or plow.

In its early growth it develops a few small, spine-pointed leaves but as it becomes older it forms a tangled mass of slender spine covered stems, from three to six feet high, bearing occasional small, white flowers with yellow centers.

The illustrations in Fig. XI. give a fairly good idea of the strong, woody rootstocks and characteristic thorny stems.

When we drive this weed from our fields by one or two seasons of proper cultivation, we are apt to overlook the fence rows and ditch banks from which its long rootstocks reach out year by year until they in time infest the

the fields as badly as ever. Many of us should give more consideration to keeping weeds of this character from the borders of our fields, as it is largely from this source that our pastures become overrun and our meadows unfit for hay.

SOME INTRODUCED WEEDS.

There are a number of weeds of world-wide distribution that follow civilization to whatever country it extends. We are all familiar with



Fig. XII. Pigweed—*Amarantus retroflexive*, L.—A, flowering branch; B, a seed; C, a seed magnified

ground for the coming season if the plant be not uprooted in early summer before it begins to mature its fruit.

tumble weed, pigweed and purslane, annual weeds which appear wherever fields are cultivated. All these weeds cause considerable harm to crops throughout Arizona, where thorough cultivation is not practiced. The tumble weed and purslane require no description, but several so-called pigweeds infest our fields. They all show a family resemblance. Fig. XII illustrates our most abundant species. It is a rank rough-leaved plant with a long tap root and productive of a great abundance of shiny, black seeds.

These seeds thor-

TABLE OF FIFTY ARIZONA WEEDS.

The following table contains a list of fifty Arizona weeds. In this table a comparison is made showing the most widely distributed species, their obnoxiousness, methods of distribution, longevity and resistance to eradication.

The weeds of this list which are of value as forage are pointed out; so, also, are native and introduced species indicated and common names noted.

	Disseminated by seeds only.	Disseminated by roots and cutstocks as well as by seeds.	Weeds of some value as forage.	Introduced species.	Annuals.	Perennials.	Most difficult to eradicate &c.	Most obnoxious species.	Most widely distributed.
Prickly poppy.— <i>Argemone platyceras</i> , Link. & Otts.	x				x				
Tansy mustard.— <i>Sisymbrium canescens</i> , Nutt.	x				x				x
Purslane.— <i>Portulaca oleracea</i> , L.	x		x	x	x			x	x
Arrow-head weed.— <i>Anoda hastata</i> , Cav.	x				x				
Bull mallow.— <i>Malva borealis</i> , Wallm.		x		x		x	x	x	
Nigger weed.— <i>Sphaeralcea angustifolia</i> , Spach.	x					x		x	
Trailing poppy.— <i>Tribulus grandiflorus</i> , Benth. & Hook.	x				x				x
Pignut.— <i>Caesalpinia falcaria pringlei</i> , Fisher.		x				x	x	x	
Velvet weed.— <i>Gaura parviflora</i> , Dougl.	x				x				x
Sunflower.— <i>Helianthus annuus</i> , L.	x				x			x	x
Cocklebur.— <i>Xanthium canadensis</i> .	x				x			x	x
Miasma weed.— <i>Verbesina encelioides</i> , Benth. & Hook.	x				x				x

	Disseminated by seeds only.	Disseminated by roots and rootstocks as well as by seeds.	Weeds of some value as forage.	Introduced species.	Annual	Perennials.	Most difficult to eradicate.	Most obnoxious species.	Most widely distributed.
Spiny aster. <i>Aster spinosus</i> , Benth.	x					x	x	x	
Rag-weed.— <i>Franseria hookeriana</i> , Nutt.	x					x			
Tall ragweed.— <i>Ambrosia aptera</i> , D C.	x				x				
Blue weed.— <i>Helianthus ciliaris</i> , D C.	x					x			
Star thistle.— <i>Centaurea melitensis</i> , L.	x			x	x				x
Lemon weed.— <i>Pectis papposa</i> , Gray.	x				x				
Beggar's lice.— <i>Echinopspermum redowskii occidentale</i> , Watson.	x				x				
Heliotrope.— <i>Heliotropium curassavicum</i> , L.	x					x			
Small tumble-weed.— <i>Krynitskia crassise-pala</i> , Gray.	x				x				x
Bind weed.— <i>Convolvulus in-canus</i> , Vahl.	x					x			
Dodder.— <i>Cuscuta epithy-num</i> , Murr.	x			x	x				
Morning-glory.— <i>Ipomoea mexicana</i> , Gray.	x				x				
Jimson weed.— <i>Datura meteloides</i> , D C.	x								
Ground-cherry.— <i>Physalis lobata</i> , Torr.		x				x	x		
Tall ground-cherry.— <i>Physalis angulata</i> , L.	x				x				x
Horse nettle.— <i>Solanum elaeagnifolium</i> , Cav.	x					x	x	x	

	Disseminated by seeds only.	Disseminated by roots and rootstocks as well as by seeds.	Weeds of some value as forage.	Introduced species.	Annuals.	Perennials.	Most difficult to eradicate.	Most obnoxious species.	Most widely distributed.
Mullein.— <i>Verbascum thapsus</i> , L.	x			x					
Devil-claws.— <i>Martynia fragrans</i> , Lindl.	x				x				
Horehound. — <i>Marrubium vulgare</i> , L.		x		x		x			
Tumble weed. — <i>Amarantus albus</i> , L.	x				x			x	x
Pigweed. — <i>Amarantus retroflexus</i> , L.	x			x	x				x
Low pigweed.— <i>Amarantus palmeri</i> , Watson.	x				x				
Fringed pigweed.— <i>Amarantus umbriatus</i> , Bth.	x				x				
Scurfy pigweed.— <i>Cladotrix lanuginosa</i> , Nutt.	x				x				
Goose foot. <i>Chenopodium album</i> , L.	x			x	x				
Salt weed. — <i>Suaeda torreyana</i> , Watson.		x				x			
Skeleton weed.— <i>Eriogonum deflexum</i> , Torr.	x				x				x
Smartweed. — <i>Polygonum lapathifolium</i> , L.		x				x			
Dock.— <i>Rumex berlandieri</i> , Meisn.		x				x	x	x	
Goat weed.— <i>Croton texensis</i> , Muell.	x				x				
Rattlesnake weed.— <i>Euphorbia albomarginata</i> , T. & G.		x				x			
Nut-grass.— <i>Cyperus esculentus</i> , L.		x				x	x	x	

	Disseminated by seeds only.	Disseminated by roots and rootstocks as well as by seeds.	Weeds of some value as forage.	Introduced species.	Annuals.	Perennials.	Most difficult to eradicate.	Most obnoxious species.	Most widely distributed.
Johnson grass. -- <i>Sorghum halepense</i> , Pers.	x	x	x		x	x	x		
Bermuda grass. -- <i>Cynodon dactylon</i> , Pers.	x	x	x		x	x			
Switch grass. -- <i>Festuca [Diplachne] fascicularis</i> , Lam	x	x			x				
Knot grass. -- <i>Paspalum distichum</i> , L.		x	x		x	x			
Squirrel-tail grass. -- <i>Hordeum jubatum</i> , L.	x				x				x
Sow thistle. -- <i>Sonchus oleraceus</i> , L.	x	x	x	x	x				x