

DEPARTMENT OF AGRICULTURE,
SYDNEY, NEW SOUTH WALES.

WEEDS :

BY

C. T. MUSSON,
Hawkesbury Agricultural College.



SYDNEY: CHARLES POTTER, GOVERNMENT PRINTER, PHILLIP STREET.

1895.

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Definition of "Weeds."

"WEEDS" are defined as, "Plants out of place"; "Any plant growing in cultivated ground to the injury of the crop or desired vegetation, or to the disfigurement of the place"; "Any unsightly, useless, or injurious plant." Webster adds, "the word has no definite application to any particular plant."

Without entering into any critical examination as to exactly what plants *are* weeds and what are not, we may accept as "weeds" any plants that are of no use to man, so far as we know, and are impediments to cultivation. In a general way this definition of "weeds" will serve our present purpose. It will be shown shortly that plants may be at one time weeds, whilst under different circumstances they may be fairly classed as useful; moreover, it may be said that, contemplating plants as a great assemblage of life forms, none of them are without some use in the world. It is from man's special point of view as a cultivator that weeds incur odium, for there can be no doubt that even weeds fulfil a duty in the great scheme of nature.

Plants become "weeds," not because of any innate tendency on the part of plants causing them to pose as ill-conditioned members of the vegetable kingdom, but on the consent and by the inaction of man. They become "weeds" when they crowd out other more useful plants.

Shakespeare says, "Most subject is the fattest soil to weeds." Good soil grows weeds better than does poor; the obvious lesson to be gathered from this fact is, "not to let the useless plants grow"; man can by forethought and by the adoption of proper precautions keep such down and allow only useful plants to mature.

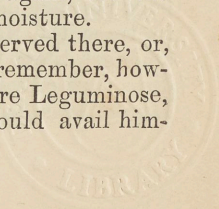
Disadvantages of Weeds.

It will be interesting to observe in what ways weeds are disadvantageous.

(a) When growing luxuriantly they prevent sunlight from acting properly on the ground or on any low growing crop, consequently diminishing soil activity and assimilative power in the crop.

(b) They prevent air from reaching the soil; this is bad again, for the supply of oxygen then runs short. They also absorb much moisture.

(c) They take plant food out of the soil that might be reserved there, or, better still, be made use of by some useful crop. We must remember, however, that when weeds are ploughed in, especially such as are Leguminose, they make good green manure. The cultivator could and should avail him-



self of the fact, and sow suitable seed where found necessary, with the express intention of growing a crop to be used as a green manure; weeds would, under such circumstances, be to a great extent smothered out, and the maximum capabilities of the soil made use of. We should be taxing the soil too much, however, if such crops are always *reaped*; when grown between fruit trees, and in many other cases, they should be grown as "plant food conservers," and ploughed in as indicated.

(d) They cause great loss of time in the work necessary for their eradication; though, we must remember, this necessitates constant cultivation, and in frequently stirring the soil we encourage favourable circumstances with respect to plant growth.

(e) Many weeds are detrimental to stock, being distinctly injurious, either (1) from being poisonous, or reputed so, as Darling Pea and other Leguminosæ, certain Euphorbiacæ, Thymelacæ, and Campanulacæ. No doubt many cases of plants proving unwholesome for stock arise from the fact that, owing to regular food being scarce, they change to a new kind suddenly, and are at times seriously affected thereby, the result causing apparent poisoning; or (2) they may be indirectly injurious, not from any poisonous qualities inherent in the plant, but from the fact that a heavy feed on such plants as the stagger-weed, causes formation of gas in the animal's stomach and brings about the condition known as "blown" or "hoven"; or (3) plants may be injurious to wool, as spear grasses, clover burr, and Bathurst burr; or (4) injury may be done to the stock through mechanical causes, as in the case of spear grasses injuring sheep, emex, and the fruits of Paddy lucerne causing inflammation in fowls.

(f) Some are parasitic, as dodder and mistletoe, true plant thieves.

(g) Fungous pests live upon weeds parasitically, to the detriment of the weeds certainly, but such plants in supporting fungi help to retain in existence innumerable colonies of fungoid pests. To take one case out of many: numerous wild Cruciferæ are the hosts of white-rust and a powdery mildew (a *Peronospora*, very common on a wild *Senebiera* with us), both of which pests attack crop plants of the same natural order, as cabbage and horse-radish, at times causing serious damage.

Were there no weeds, we, in treating plants for diseases, would have our chances of eradicating them enormously increased. Many spores would die out without germinating if no nurse-plant existed to be made use of, perhaps, just at a critical time, when, failing a nurse-plant, the spores must die.

Failing crop plants, weeds form the hosts upon which many fungi live. We treat the crop plants and allow the weeds to carry on their pernicious work. Theoretically, we should allow nothing to grow in our cultivated ground unless acting beneficially; practically, this is almost impossible, our every-day life shows that we cannot always do what we should do. Did we follow this rule out, however, to the best of our ability, we should certainly reduce many pests to a minimum, bringing plant disease under such control as would enable such as occurred to be much more satisfactorily dealt with than is at present the case.

All fungus-smitten plants may be looked upon as detrimental in one way or another, directly or indirectly; they *must* be detrimental to stock, as has been pointed out by several writers, though we may frequently not be able to trace the ill effects. A few amongst the parasitic fungi are useful, amongst them Ergot of Rye: this pest, though medicinally valuable, has a disastrous effect upon cattle if eaten by them. The Root-tubercle Bacilli of Leguminosæ furnish another instance.

(h) Not only do weeds support fungous pests, which at times attack our crops, but they, to a large extent, provide food for insects, which, in very many cases, when opportunities arise, attack crop plants. For instance, many of subterranean habit, wireworms (the larvæ of click beetles), curly white grubs (larvæ of cockchafers), mole crickets, and others, attack plant roots indiscriminately. Again, wild Solanums support insects that will damage cultivated plants; the 28-spot ladybird in this country and the Colorado beetle in U.S.A. for instance. In cultivated ground the soil is kept loose, and as crop plants are often very succulent, and even weeds grow more luxuriantly in such soil than in such as is hard and uncultivated, plentiful food, and of the most approved kind, is provided for insects. It is easy, therefore, to understand why pests concentrate in the cultivated parts of the earth. We must not forget that in doing away with much of the earth's natural covering of grass and forest we are destroying insect food. Insects must find food somewhere or die; consequently our crops suffer. Moreover, it is only natural that our tender succulent vegetables and fruits should be appreciated when once tried. Damage consequent upon insect attack prepares the way and provides opportunities for fungoid pests which are present everywhere in the spore state, generally incapable of damaging a plant whose protective epidermis is intact, but ready for any chance bruise or open spot of any kind on the bark of the stem or the skin of the fruit that will give access to the soft tissues: if an opening is found the plant has to suffer from fungous attack, and is to a great extent powerless to resist. The spore simply fulfils its life's work, building up a new generation, making use for that purpose of food provided by the host.

From the insect and fungus point of view, the allowing of weeds to grow is just the particular thing required at times to tide them over periods of drought, danger, and distress. In keeping weeds down we either kill pests out by starving them or we drive them away in search of food. In the latter case our neighbours should see that they have not allowed their weeds to remain to provoke attack by presenting the travelling pests with attractive food. In all cases (very numerous in nature) where insects and fungi can only flourish on some one plant or small group of plants, we prevent the pests from establishing themselves if we keep down their natural food plants, as they do not readily take to new kinds of food. Many pests have, however, through stress of circumstances, become accustomed to variety of food; more particularly is this the case with locusts, scale, and many insects that feed by means of a sucking tube.

Weeds sometimes advantageous.

There is, however, another side to the question. "Weeds" are not always useless, either in themselves or by nature of their location. Many plants that are weeds under one set of circumstances, may become useful plants under another. This apparent paradox introduces one of the most interesting phases of the whole subject. A few examples will serve to illustrate the point.

1. On steep ground where heavy rainfall occurs it is sometimes advisable to allow orchard weeds to remain through the worst of the rainy weather, as they prevent the soil from being washed away. Under such circumstances plants that are suitable for green manure would grow equally as well as weeds and prove more useful—Buckwheat or some suitable leguminose plant, for instance, providing at once protection for the soil, plentiful bee food, and, when ploughed in, good green manure. Such a crop would conserve impor-

tant manurial elements that might otherwise be carried away in the rain-water draining from the land, besides returning to the soil, in the case of leguminosæ, more nitrogen than it took out; the supply of this important element coming partly from the air through the medium of special organisms in the root tubercles.

2. Weeds sometimes provide good food for stock. The clover burr (*Medicago denticulata*), although damaging wool by reason of its hooked fruits, being difficult to clear away when once in it, is a most useful fodder plant, both in respect of its stem and leaves, and of the fruits when ripe; when nothing of stem or leaf remains, the fruits, often lying on the ground in great numbers, not only keep alive, but will fatten sheep. The Cape weed (*Cryptostemma calendulacea*), an introduced composite, is also useful as a fodder plant; and an introduced Crowfoot, one of the Geraniaceæ, gives, in the Riverina, a most valuable spring fodder. I have seen horses daintily picking the flowers from heads of the despised black thistle. The variegated or spotted thistle (*Carduus marianus*) makes capital ensilage, indeed, it is said that *all* weeds are suitable for the silo. Balm or Stagger weed (*Stachys arvensis*) is most plentiful in orchards with us; it is a valuable bee plant, a quality also possessed by the small Cape weed or mock dandelion (*Hypocheris*). Paddy lucerne (*Sida rhombifolia*), a bad weed when growing out of place and uncared for, sown thickly and properly looked after, produces a useful fibre, not of the first class, but quite as good as many fibres that find a market; moreover, the leaves and young tops are freely eaten by stock. The nut grass (*Cyperus rotundus*), an ineradicable pest in cultivated ground, finds a use for its tubers in their being good pig food (the ground, however, is so rooted up in the search for them, that its appearance is quite spoilt), and when dry and crushed they are sweet-scented. Horehound (*Marrubium vulgare*), a common weed in many parts of New South Wales, when dried is marketable in moderate quantities. Couch grass (*Cynodon dactylon*), a bad weed of cultivation, but a valuable fodder grass, finds another use in India, where the underground stems are turned to account in making a cooling summer drink. All our cultivated plants have descended from wild forms possessing some favourable characteristic; by careful cultivation and selection their possibilities in certain directions have been encouraged and developed; take away the care and attention and they revert to their original forms. Many plants, frequently called weeds, form valuable additions to our pastures, from possessing medicinal properties, tonic or purgative, for instance, not only giving varied, but healthy, food. It is a question whether we are right in applying the word "useless" to any plant; even in the case of any so-called poisonous plants there is something to be said: it would be an interesting point to decide whether poisonous principles in plants (of which, by the way, nothing can be traced in our well-known Darling pea), frequently dissipated by heat, would be got rid of in the silo.

Where our Weeds came from.

Many of our so-called weeds are native to the country, but a large proportion of the worst of them have been introduced from abroad. About 250 species of foreign plants are now found naturalized in New South Wales, coming from all parts of the world, but chiefly from those countries with which our commercial intercourse is greatest. Some of them were introduced as useful plants of set purpose, but having fallen into disuse now cumber the ground; the greater quantity, no doubt, have been brought unwittingly by man in the ordinary course of trade. Only a short time ago

a box of fig cuttings from Smyrna was opened in the College orchard; next season several strange plants sprang up near where the unpacking had been done. Amongst them* *Artemisia vulgaris*, a composite; *Hypocoum procumbens*, a poppy; *A. vesicaria*, allied to the starworts and pinks; *Trifolium resupinatum*, and two other undetermined *Leguminosæ*. We were very careful to destroy every example of these plants before seeding. I lately received through a student of the College specimens of what is evidently *Martynia proboscidea*, one of the *Pedaliaceæ*, from a paddock in the Richmond Bottoms. In the course of trade exchanges, various seeds travel from country to country. "Over sixty species of aliens have appeared on railway banks, on dredgings from the river Trent, and on waste ground near maltkilns and mills at Newark (England) recently—that is, since the barley, wheat, oats, and linseed have been imported from Smyrna, Cyprus, Bohemia, Hungary, and other foreign lands."† Amongst the plants mentioned in the list are several that we recognise as bad weeds here, *e.g.*, the star thistles.

How Weeds become distributed.

It is of great interest to note that plants very frequently possess special structures that aid in the distribution of their seeds; especially is this the case with many of our more pernicious weeds, indeed it is often the case that the very peculiarity causing a plant to be a dreaded weed is the particular means by which the plant is enabled to distribute its seeds. In the Bathurst burr there are strong hooks on the fruit that secure it firmly, as we know, to the tails of animals and to the wool of sheep; we look upon the plant as a curse, and so it is from our point of view, but could the plant speak for itself it would thank us heartily for keeping sheep and for travelling them, as owing to these two facts the plant is enabled to make use of its special facility for distribution. Many other plants possess in the structure of their fruits some special means enabling them to spread when aided by animals. The clover burr spreads by the same means as the Bathurst burr. Sweetbriar spreads, however, in a somewhat different way; its seeds pass through the bodies of animals without losing their germinating power. We have only to point to the condition of travelling stock routes and reserves to emphasise the point as to the help given by travelling stock in the spreading of plants abroad. Again, in the dandelions and thistles there is an aid to distribution in the hairy pappus, a sort of wind-sail which enables the fruit to which it is attached to travel great distances by help of the wind. I have seen numbers of these "flying fruits" come into a railway carriage travelling 30 miles an hour. Such travelling fruits or seeds do not always find a suitable habitat; they are, however, much helped in this country by the fact that the surface is frequently bare of grass in very dry years, or bare patches of ground occur round trees used by cattle for rubbing purposes, or along travelling stock routes. Under such circumstances all seeds have an equal chance, and the hardy intruders often dominate over the native-born (indigenous). Thistles and Bathurst burr often start centres of infection in this way and gradually spread around. Some weeds are most plentiful in cultivated ground, as sour sorrel; others on grass land, as sweetbriar and thistles. Many spread from gardens where they may have been cultivated for certain reasons. Some have been introduced for fodder purposes, and

* I am indebted to Mr. F. Turner, F.L.S., for the names.

† On the Botany of Nottinghamshire, by H. Fisher, in "A Contribution to the Geology and Natural History of Nottinghamshire," for the Nottingham Meeting of the British Association, 1893.

falling into disuse, have spread over both cultivated and uncultivated ground. Weeds may come mixed with seed, in hay, in manure, carried by birds, by the elements, by rivers, in endless varieties of ways; most interesting as it would be to dilate on these points space forbids. For variety and numbers an old town not too far from the coast will, especially along its less used streets, prove most prolific in weeds, growing everywhere, even in the forks of old cedar trees and the heads of palms. It is amongst weeds and wild plants generally that the true student of nature, as reflected in plants, obtains many of his most interesting problems. Cultivated plants change their characters, therefore to get the real original type we have to look to Dame Nature herself. One only needs to read that beautiful story, "Picciola, the Prison Flower," to realise what the presence of one humble plant may be to an active mind completely shut off from communication with man and nature.

Look at "weeds" as we may, however, we must perforce conclude that such plants as are occupying ground to the detriment of crop-plants are in the way, and are useless to us for the time being; such plants it is necessary to exterminate.

How to Exterminate Weeds.

In cases of plants seen immediately on their introduction, this is a tolerably easy matter; they should not be allowed to establish a foothold. We have heard of the person who saw the first few plants of Bathurst burr. Five minutes exertion to uproot them, a fire to destroy them, and years of troublesome work, millions of money, would have been saved; but "it is as it is"; we have the burrs, probably now never to get rid of them. In eradicating first centres of infection we prevent pests spreading; any suspicious-looking newcomers should therefore invariably be carefully destroyed. It is frequently not sufficient to merely pull them up, especially if the fruit is ripe.

In endeavouring to exterminate weeds generally the nature of the plant must be taken into consideration. Annuals should be prevented from seeding. Biennials and perennials, all such as propagate by means of their roots, tubers, underground stems, and such means, should be prevented from breathing, by keeping the leaves from appearing. Early and constant cultivation will therefore keep them down in cultivated ground. Shakespeare says—

" 'tis spring, and weeds are shallow-rooted,
Suffer them now, and they'll o'errun the garden."

In preventing plants from maturing their seed we prevent them from spreading; and in constantly chipping out biennials and perennials we prevent the plant developing its stores of nourishment in tubers, stems, and other parts. Apart also from the beneficial effect secured in several ways by keeping weeds down, the crops benefit directly, particularly in dry regions, through constant stirring of the soil.* In case of weeds on garden paths, boiling water, or some weed extermiator, may be used with advantage. Selvidges to cultivated ground are commonly left to look after themselves. These narrow strips are usually prolific in weeds, and act as reserves from which such plants are distributed in all directions. If it is impossible to

*"The moisture saved by arresting surface evaporation must not be lost by allowing thirsty weeds or grass to exhaust it. It has been shown by Professor S. W. Johnson that, under similar circumstances, during a month of summer weather, the loss of water from a soil covered with growing grass was nearly two and one-half times greater than the loss from naked soil; also, that evaporation from a hoed surface was only four-fifths that from a hard surface."—(Flint.) Mr. H. C. Russell, F.R.S., has also shown "that grass brings the subsoil water to the surface and aids evaporation in dry earth."

keep such strips clean, clover or some other useful bee plant might be sown, it would soon smother out the weeds. We must, however, give if we take, we cannot expect receipts without expenditure; notwithstanding constant attention plants will be introduced from outside, and will grow where they are not wanted, meaning just this: weeds are a power in the world, so strong that they, through their omnipresence, are one great operating cause in forcing man to work. If the soil has to support weeds *and* crop the latter must suffer; given a minimum of weeds, the crop has the better opportunities; therefore we cultivate, and the more we do so the better the returns. It really rests with ourselves whether weeds trouble us or not; to keep them down means work, work means time, and time is money. On the other hand, presence of weeds means reduced return, in the crops being lighter; the expense incurred in getting rid of weeds—that is, the cost of cultivation—may be considerable, but work is provided, and we have the outlay returned to us in the increased crop.

We have, therefore, two good reasons why attention should be paid to the keeping down of weeds. In the first place better opportunities are given to the crops, in that they would be without competitors which at present cause them to be heavily handicapped in their life struggle; and in the second place constant cultivation is distinctly beneficial in its general effect upon the soil in its relation to plant-life.

It seems to me that in the growth of weeds nature asserts herself and tells us incontrovertibly "The soil cannot remain bare; it must grow something; if you, men, desire to live comfortably, you must cause the soil to grow plants useful to you, instead of such as are of no use and cause expenditure in nature in the wrong direction."

A few words in conclusion with regard to legislation on this matter. Some few noxious plants have been dealt with in order to bring about their extirpation; but success has been conspicuous by its absence. It seems to me that in order to cope with bad plant-pests, provision should be made in a comprehensive Bill, dealing with fungus, insect, and weed pests; the provisions to be carried out by qualified officers, equipped with the necessary appliances. Better, however, than any Bills would be an understanding amongst all men that noxious pests are to be exterminated. If, acting for ourselves, and up to our opinions, we all did our duty in this way, our efforts would be crowned with a great measure of success; but how many men do we know who, whilst crying out for legislation, will not take the trouble to cut down a few noxious weeds in his own paddocks, or those on the wayside near his own land?

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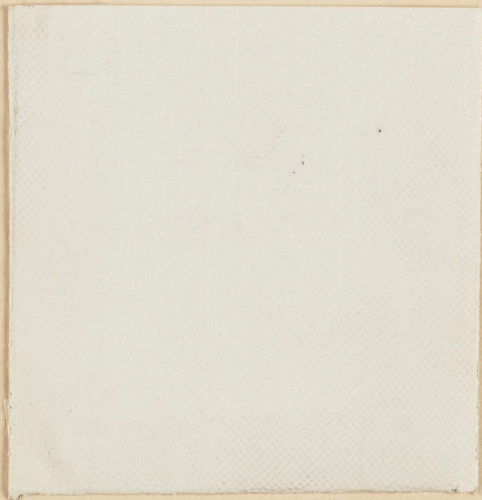
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