Under all soil and climatic conditions, certain plants come up at all times and persists in growing. These plants are weeds.

There are various ways of defining a weed. A simple and effective definition is that a weed is a plant out of place. By this definition, any plant that is growing where it is not required takes on the attributes of a weed. Thus, a beautiful flower or a tree becomes a weed if it happens to shade or affect a more desirable plant (in that spot). Weeds, therefore, are of no particular plant-group - they may be any plant - if they are growing in the wrong place. To take one more example, alfalfa or sweet clover growing in a field of maize will interfere with the growth of the last-mentioned plant; here the interference is through the use of available moisture and plant-food and hence alfalfa or sweet clover must be reckoned as weed plants. If a farmer were to sow soybeans with his maize, the soybeans would not fall in the category of weeds as they are raised with a definite purpose. When the soybeans are thriving spontaneously in the maize field and the farmer wishes to get rid of them, they are classed as weeds. Pieters (1935) went to the extent of defining a weed as a plant which "does more harm than good and has the habit of intruding where not wanted". This definition would not cover all the examples given above, since the volunteer soybeans could hardly be regarded as having acquired the intruding habit where they are not wanted. Georgia (1914) designated a weed as "a plant growing
where it is desired that something else shall grow". To Muenscher (1955), "weeds are those plants with harmful or objectionable habits or characteristics, which grow where they are not wanted, usually in places where it is desired that something else should grow". Robbins et al. (1952) termed those obnoxious plants as weeds which are "unwanted, nonuseful, often prolific and persistent, interfere with agricultural operations, increase labor, add to costs and reduce yields". It is apparent that the definition of Robbins et al. is all-inclusive and all-embracing, although the definitions given by Georgia and Muenscher are quite appropriate. However, in a strict sense, there are no species of weeds. Whether a given species is regarded a weed depends not only on its pernicious characteristics and aggressive habits, but also on its relative importance with reference to other plants and to human beings.

Varying greatly in size, form and behaviour, weeds occur in many families. Scarcey does one species possess all the undesirable features that we associate with weeds. Some weeds are close relatives of valuable crop species. Again, what is weedy in one part of the world may be useful in another. The vast majority of weeds are herbs, but shrubs, such as species of Lantana and trees like Ficus religiosa are not uncommon.

There are several remarkable traits that enable plants to become weeds, all being related to seeding and growth-habits.
Firstly, many weeds are capable of growing under adverse conditions, as they bear modified or much reduced leaves and other aerial parts. Secondly, many weeds are able to thrive under conditions favourable and unfavourable for the growth of crop plants. Thirdly, a great number of them ramify vegetatively, even though they are prevented from seed production. Fourthly, many, if not all, are able to form new plants from injured or cut portions. Fifthly, the flowers of many weeds are so small and inconspicuous that their presence is suspected only when the seeds reach maturity. Sixthly and lastly, many weeds are covered with spines, thorns, stiff hairs or sticky secretions and may contain substances giving off unpleasant odour or taste.

Few realise what a harm weeds cause to human existence!

The preparation of many products of the soil for our consumption as well as the production of almost all crops is mainly a fight against weeds or elimination of their effects. The losses or injury, according to Datta (1959), on account of weed nuisance are as follows:

1. Weeds grow along with useful plants and occupy the space necessary for them. Due to their rapid growth, they afford shade to seedlings and shorter plants.

2. The water requirement of weeds are very high, since they compete with crops for water. For example, the water
requirement of Sorghum (Sorghum vulgare) is 430 and for the weeds which grow along with it are 556 for Ischaemum pilosum, 813 for Cynodon dactylon, 1,108 for Tephrosia hamiltonii and 1,402 for Tridax proculbens.

3. As weeds are usually vigorous plants, their demands for mineral nutrients are considerable. Wild mustard (Brassica sinensis) absorbs twice as much phosphorus, twice as much nitrogen and four times as much potash as a cultivated oat plant.

4. Some weeds exist as total parasites or semi-parasites upon crop host. Balanophora causes serious damage to coffee, dodder (Cuscuta) to clovers, Orobanche to brinjal, tobacco, tomato and other solanaceous crops and Loranthus and Viscum to horticultural trees.

5. Certain weeds harbour insect pests as well as fungal and bacterial diseases which are also transferred to crop-plant hosts. The potato beetle lives on many plants of the Solanaceae. The rusts pass a part of their life-cycle on weeds which help in the over-wintering of the fungus. The bacterial organism, causing bean blight, thrives upon some of the wild legumes.

6. Some weeds impair the quality and quantity of livestock products. Spines and hooks reduce the value of hide or wool. When ragweed (Ambrosia artemisiifolia) and bitterweed
(Helium tenuifolium) are consumed by cows, they are liable to
taint milk.

7. The leaves and stems of several weeds are poisonous.
Halogeton (Halogeton glomeratus) kills thousands of sheep every
year in the western sector of United States. Locoweed (Astragalus
hornii) of the prairies and deserts of North America is a source
of constant danger to grazing animals. An itching sensation
is produced on throat of horses fed on barley mixed with
Euphorbia dracunculoides.

8. Weeds diminish the quality of farm products. Weedy hay
is highly objectionable. The market value of mustard is greatly
reduced if contaminated with seeds of Argemone mexicana. The
presence of certain weeds in wheat imparts an unpleasant flavour
to the flour when milled. Bulblets of wild garlic or wild onion
are sometimes found in freshly harvested crop of wheat.

9. A number of weeds add discomfort to human beings.
Victims of hay-fever can trace their distress to the pollen-
grains of weedy plants. Poison oak (Rhus diversiloba), poison
ivy (R. toxicodendron) and poison sumac (R. vernix) are pois-
onous to the touch and cause much suffering to many individuals.
Occasionally, deaths are reported from eating fruits, seeds or
tubers of weeds.

10. Weeds bring about depreciation of land values and
increase the cost of farm-operations.
It has been claimed that weeds cause more loss to agriculture than all other plant-pests put together. That weeds adversely affect the growth and yield of crops have been determined by different workers (Hedayetullah and Sen, 1942; Kumar, 1942; Brenchley and Long, 1947; Sethi, 1949; Panikkar, 1950, 1953; Kaul, 1951; Haq, 1955; Seth, 1958; Chakravarti, 1963; Tripathi and Misra, 1971). The economic loss in solanaceous crops on account of brown rape (*Orbanchus indica* and *O. cernua*) are to the extent of 5-10% in Bengal, 15-20% in Bombay, 20-30% in Madhya Pradesh and 30-70% in Madras. *Saccharum spontaneum* has infested 10 million acres of arable tracts in Uttar Pradesh, Madhya Bharat and Vindhya Pradesh. It has been observed that the yield of wheat is lowered by 10.5% due to the ravage of weeds. In Bombay, the presence of *Striga* in wheat fields cause a loss of 10 lakhs of rupees every year. The loss brought about by *Striga* depredation is in the range of 80% in Kerala. Wild rice has reduced the yield of paddy by 5-30% in some districts of Bombay and by 50-60% in Kangra district of the Punjab. The difference between a weedy rice crop and a non-weedy one has attained a loss of 46% in monetary value. In undivided Bengal alone, 100 millions of rupees annually were lost due to water hyacinth (*Eichhornia crassipes*). In Madras, certain species of *Panicum* and *Cyperus* have threatened the cultivation of paddy. The algal weeds like *Chara* and *Nitella* tend to create troubles in the paddy-
Typha angustata is spreading like wild fire and has wrought extensive damage to the wet-paddy crops in the Nagarjunasagar area in Guntur district of Andhra Pradesh. Recently, African payal (Salvinia auriculata) is becoming a serious problem in Kerala. Submerged aquatic weeds like Hydrilla, Nais, Ottelia, Utricularia, Vallisneria, etc. render about 50-60% of cultivable waters in the States of West Bengal, Assam, Orissa, Bihar, Uttar Pradesh and Madhya Pradesh unfit for fish culture. Lantana has already become a threat to Santalum forests of South India and in Himachal Pradesh. The poisoning of honey bees, foraging on certain weeds like Euphorbia geniculata, is of common occurrence in some parts of India.

It is thus evident that the menace of weeds has assumed alarming proportions in India. In many instances, the loss due to weeds has been estimated to be as high as 70-80%. If we take a conservative view of the total agriculture produce, the amount for this country would come to 4,200 millions of rupees for principal cereals, pulses, oil-seeds, chillies, sugarcane and cotton. Such economic scourage warrants urgent attention and points out the need for developing weed control programmes in high-yielding varieties as well as cash-crops. At present, weed control measures are adopted annually only over 2-3 lakhs of acres which is insignificant compared to the total cultivated area.
Such being their effects on agriculture, horticulture, forestry, fishery and apiary, it is seemingly important to undertake basic and applied investigations on weeds. Considerable work on the subject have been done in foreign countries and the results published in a number of textbooks (Ahlgren et al., 1951; Robbins et al., 1952; Muenscher, 1955; King, 1966) and reviews (Norman et al., 1950; Crafts, 1953; Woodford et al., 1958). As regards India, the papers of Das (1956), Verma et al. (1958), Choudhri and Garg (1959) are of value. But all studies in this country are either fundamental or lay emphasis on control measures. So far, no attempts have been made to prepare an account of weeds of crop plants which would be comprehensive and exhaustive.

The present work embodies a floristic study of weed species affecting a major crop of West Bengal rice. Not only their habit, flower colour and peculiarities of root system are noted, but also the flowering and fruiting time of weeds. Artificial keys have been prepared based on the morphology of plants (largely without seeds) as well as on the external characters of seeds. Moreover, the number of seeds produced by a single weed species and the weight of these seeds have been estimated. It has also become necessary to find out the methods of propagation, gross stem anatomy and amount of water transpired by the weeds. Finally, this treatise has brought together and collated all the available information concerning
medicinal and other economic uses of the weeds.

It is suggested that such a study will not only facilitate the recognition of rice-field weeds at any stage of growth or development but also provide hints as to their cultural control in their natural habitat and/or their proper utilization for the benefit of human beings.

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