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Review
THE ROLE OF WEEDS AS A COMPONENT OF BIODIVERSITY IN AGROECOSYSTEMS

Reseña
El rol de las arvenses como componente en la biodiversidad de los agroecosistemas

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ABSTRACT. Agriculture consider weeds as undesirable in agroecosystems. However, a great amount of farmers of the tropics, estimate then by their value and benefit they bring in an agricultural system. In this paper, it is disclosed the importance of incorporating different scientific disciplines and weed management systems in agriculture with less impact on the environment. Besides it is refered to the usefulness of important weeds as plants: biocides, medicinal, soil improve, new crops and source of food for humans and animals.

RESUMEN. La agricultura considera a las arvenses como indeseables dentro de los agroecosistemas. Sin embargo, una gran mayoría de campesinos del trópico, las estiman por su valor y beneficio que aportan en un sistema agrícola. En el presente escrito se da a conocer la importancia de incorporar diferentes disciplinas científicas y sistemas de manejo de arvenses en una agricultura con menos impacto en el ambiente. Además, se hace mención de la utilidad de arvenses importantes como plantas: biocidas, medicinales, mejoradoras del suelo, fuente de nuevos cultivos y alimentación para humanos y animales.

Key words: agroecology, management, competition, weeds and agriculture

Palabras clave: agroecología, manejo, competencia, arvenses y agricultura

INTRODUCTION

Agroecology is emerging as the fundamental science to guide the conversion of conventional production systems (monocultures dependent agrochemical inputs) to more diversified and self-sufficient systems. For this, it uses ecological principles that favor natural processes and biological interactions that optimize synergies so that agricultural biodiversity is able to subsidize itself key processes such as accumulation of organic matter, soil fertility, mechanisms of biotic regulation pest and crop productivity. These processes are crucial condition for the sustainability of agroecosystems. Most of these processes are optimized by specific interactions that arise from spatial and temporal combinations crops, animals and trees, supplemented by organic soil management (1).

This provides guidelines for developing diversified agroecosystems that take advantage of the integration of animal and plant biodiversity. The successful integration of plants and animals can strengthen positive interactions and optimize the functions and processes of the agroecosystem, such as the regulation of harmful organisms, nutrient recycling, biomass production and the formation of organic matter. Thus agroecosystems become more resilient (1, 2).

There is currently a lot of practices and technologies to improve the functioning of agroecosystems. When agroecosystems are developed to be in line with existing environmental and socioeconomic conditions, the end result is greater ecological sustainability (3). By adopting ecological management practices the farmer can increase stability and resilience of the agroecosystem (4).

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Today, weeds have gained ground in cropping systems through conventional farming, as it is considered that the presence of different species of weeds in crops has a deep on the composition and interactions of the insect fauna of culture, to the point that predators and parasitoids are more effective in complex habitats (5). Beneficial insects are more likely to find alternative preys, shelter, places for reproduction and dormancy shelters (6, 7) also should take advantage of other benefits they provide as insecticides, repellents fungicides, human consumption and animal breeding, medicinal and soil conservation (6, 8, 9).

The implementation of the combination of the raised above aspects, provide the pattern to establish a strategy sustained agriculture, due to a greater impact on the behavior of weeds, reduced energy, reduced continuous shocks and agricultural systems increase in the number of biological, essential to maintain balance in agroecosystems interactions. So from the above the goal of this paper is not to lose the empirical knowledge on competitiveness and usefulness of the large number of plants growing in agricultural fields, orchards, gardens, pastures, forest and other sites which are exploiting human being.

ASSOCIATED BIODIVERSITY

Associated biodiversity is defined as all species of plants, animals and microorganisms that interact within an ecosystem. In all agroecosystems, pollinators, natural enemies, earthworms and soil microorganisms are key components of biodiversity and play important mediating processes such as genetic introgression, the natural control, nutrient recycling ecological roles, decomposition, among others (1, 10, 11).

Historically, diversity in agriculture has proven to be a way to protect farmers from pests and diseases. On the contrary, the path of specialization and monoculture cause increased pollution, use of pesticides and fertilizers, leading to degradation of natural resources. As a result it witnesses an accelerated process of ¨genetic erosion¨ of cultivated species, which occurs by variety substitution of grand diversity and adaptation for cultivars denominated ¨modern¨ obtained through manipulation and selection of genetic material (12-14).

Biodiversity in agroecosystems can be an indicator of the degree of deterioration thereof. It arises which is the basis for ensuring the global supply of food, survival of crops, agricultural landscapes and humanity insurance against future threats to agriculture and food. In particular, agricultural diversity or agrodiversity is a concept that brings together on biodiversity to agricultural production and includes genetic resources of plants, animals, soil organisms, insects and other organisms in managed ecosystems or agroecosystems; In addition, elements of natural ecosystems for food production (5, 6, 15).

In recent years, scientists have begun to give greater importance to the role of biodiversity in the functioning of agricultural systems, considering it is the fundamental principle of sustainable agriculture (2, 5).

CLASSIFICATION

It can recognize two types of biodiversity components: first, planned biodiversity that is the biodiversity associated with crops and animals included in the agroecosystem by the farmer that vary according to the management and arrangements of crops (16). The second, associated biodiversity, including flora and soil fauna, herbivores, decomposers and predators, which colonize the productive scenario from surrounding environments and remain in the same depending on the type of management adopted. So it is essential to identify the type of biodiversity that is desirable to maintain or increase, so that they can carry out the functions or ecological services, to determine which best management practices are and increase the desired biodiversity (9, 17 18).

An agroecosystem should have about 150 agricultural species, to be considered good diversity. The more diverse the more complex and productive systems are stable; few have more components in biological systems, greater self-regulation mechanisms and among older will be self-regulating mechanisms, the greater the balance of systems (19-21).

AGROECOLOGY

It is the scientific discipline that focuses on the study of agriculture from an ecological perspective and it is defined as a theoretical framework, which aims to analyze agricultural processes more broadly.

The agroecological approach considers agricultural ecosystems as the fundamental units of study in these systems, mineral cycles, energy transformations, biological processes and socioeconomic relationships are investigated and analyzed as a whole (2, 22).

Agroecology is a relatively new discipline, but draws on the experience and knowledge of ancient traditional agricultural societies that modern agriculture sought to marginalize and dismantle. This proposes an approach to agriculture, from an ecological perspective, which aims to build a theoretical framework, which aims to analyze agricultural processes more broadly. It proposes a systemic approach that allows studying the conditions of the global society in the conditions of agricultural production and agroecosystems considered as units, bases its actions on a deep understanding of nature and the principles that govern it (2, 23).

The idea of agroecology is to go beyond the use of alternative practices and develop agroecosystems with minimal dependence on agrochemicals and energy subsidies, emphasizing the complex farming systems in which ecological interactions and synergisms among its biological components, provide mechanisms to subsidize the systems of their own soil fertility, productivity and crop protection (24).

Agroecology provides the ecological basis for biodiversity conservation in agriculture, in addition to the role it can play in restoring the ecological balance of agroecosystems, so that it reaches a sustainable production.

Biodiversity promotes a variety of processes of renewal and ecological services in agroecosystems (nutrient cycling, biological pest control and conservation of water and soil); when they are lost, the costs can be significant (25).

The rise of the green revolution is one of the most important factors in the deterioration of agroecosystems, not only because of the environmental impact of large amounts of chemicals that are discharged into the environment and cause ecological imbalances, but also by genetic erosion of crop plants. The system used large areas of monoculture, brought the long-term decline of diversity, increased resistance to pests, as well as the expense of soil fertility. However, it has been shown that technological innovation and agricultural development have a major impact on rural areas, where management systems remain unchanged in some cases (26).

It may also identify indirect causes of biodiversity loss, such as national and international policies, property rights and market influences. All these conditions refer to the importance of analyzing human relationships with biodiversity resources within development models (27).

CONCEPT AND GENERALITIES

It considers weeds, all higher plants, which grow together or on crops, disrupt or prevent normal development, merman expensive cultivation and yields or quality (28).

Some authors mention that weeds are plant species that coexist with economic crops and their management considered as the activity of selection and retention of noble coverages, which prevent interspecific competition during the critical period and simultaneously contribute to the protection of the natural resource soil (29, 30). On the other hand, others argue that weeds are wild plants that grow in habitats frequently disturbed by human activity. A plant is weed if in any specific geographic area; their populations grow without being deliberately cultivated (31).

Weeds are important because they have negative effects on human activities and the costs that incurred in handling to maintain populations at a level that does not reduce crop yield and do not interfere with the activities of humans or cause repulsion in sight (4, 32).

Negative aspects:

- Handling costs.
- Hinder and delay agricultural work.
- They are hosts of pests.
- Reduce crop yields.
- Reduce product quality.
- Poison animals.
- Cause health problems to humans.
- Decrease the value of the land.

Among the positive aspects of weeds the following (4) are mentioned:

- Contribute to soil conservation.
- They are a source of food as some grasses and legumes.
- They serve as medicines.

- Increase the amount of genetic material.
- Increase the stability of the agricultural ecosystem.
- They are a source of raw material for the production of organic fertilizers.

Main characteristics of weeds

The main morphological and reproductive attributes for a species to be successful as weed, are as follows (33, 34):

- Abundant seed production
- Germination, dispersion and seed dormancy

Vegetative growth and Classification

According to their habitat, they can be: wild, ruderals, pasture and aquatic weeds:

- Depending on the type of leaf: broadleaf and narrow blade.
- According to the consistency of the stem, woody, semi-woody and herbaceous.
- According to the life cycle: annual or perennial.
- According to its harmfulness: can be high, medium or slightly harmful.

ECONOMIC IMPORTANCE OF WEEDS

Weeds compete with crops for soil nutrients, water and light; host insects and harmful pathogens in crop plants and their root exudates and leakage of leaves can be toxic to the crop plants. Furthermore, they interfere with harvesting the crop and increase the costs of such operations; at harvest, seeds of these can contaminate production. Therefore, the presence of weeds in crop areas reduces the efficiency of inputs such as fertilizer and irrigation water, strengthen the density of other organisms and pests eventually severely reduce the yield and crop quality (35).

They have increased the research and studies among interactions of weeds as host plants as ecological indicators, as a source of biomass and allelopathic agents in systems of tropical crops. However, the need for weed management is continuing to investigate in order to find the most efficient way to manage or control and in some cases eradicate species or populations of these plants in agricultural ecosystems in the tropics (36).

Research in different tropical crops have been studied only the efficiency of chemical and mechanical methods applied; this is enthusiastic and were included studies on crop phenology and weeds present (37). From here was the beginning for a database with information on the biology of tropical weeds and their interactions with annuals, perennials, flora and wildlife corresponding crops.

In Cuba, Nicaragua and Mexico were developed studies on coffee plantations on the composition of the adventitious flora, effects that caused the different methods of controlling weeds in the past decades and its impact on the ecological stability of fauna and flora (34, 35).

As a result of these investigations arose, that should improve herbological knowledge of the adventitious flora by producers and advisors, as well as implementing it requires monitoring on farms; these are the foundation for sustainable management of weeds right decisions based on the timing control and the proper method for its economic efficiency and ecological safety.

WEEDS AND AGROECOSYSTEM

Agriculture is the major selective force in the evolution of weeds. Because of the succession have moved toward early stages recurrently, agricultural activities have maintained plant communities in immature stages. Most components of these communities are what we call weeds in agriculture. This term involves some 250 plant species do not constitute a particular class botanical (38).

Many of them from distant or native geographic areas and they are particularly favored by the disruption caused by agricultural activity have been introduced. Whatever its origin, the weeds are an integral component of agroecosystems and as such influence the organization and operation thereof since the dawn of agriculture (39, 40).

Traditionally and mainly because of its impact on performance, weeds are considered undesirable organisms. Both in literature and in agricultural tradition is very deep feeling of aversion that these plant organisms awaken in humans. In general, they are associated with evil, neglect, damage, loss or inconvenience of some sort (41).

Since ancient times and until recently, the problem of weeds in crops was approached from the point of view of their exclusion from the crop.

The effort to achieve that goal was huge and while demonstrating the ability of human beings to develop different disposal practices or control, naked ingenuity that has addressed the problem, with some exceptions, weeds of crops are so much trouble today as a century ago (38).

The big difference is based on the range of technological tools available today that allow crops to design sequences with low levels of infestation. This has been possible thanks to the basic and applied related to the study of the physiological mechanisms of absorption, transport, toxic action and the development of synthesis and production of herbicides investigation. It is today have more than 130 active ingredients. The global market for agrochemicals mobilizes a figure of over 16 000 million per year: herbicides mean 60 % of this figure and have contributed significantly to achieving high levels of production in recent decades (37, 42).

So far, we can conclude that weed problems today are of similar size than those in the past and that the difference is in the range of technologies that we have to face them. These technological tools, in most cases with the efficiency demanded are not by today's times used (43, 44).

An additional issue should be considered the technological breakthroughs operated from the mid-twentieth century, have caused a major change in the central ideas of agriculture. They have been based on intensive use of agrochemicals, varieties and hybrids with high potential performance in high availability of resources and the reduction of human work requirement through the widespread use of powerful new machines and high consumption of fossil energy. This system as the conventional agriculture is recognized now (45).

Already in 1973 it warned of the consequences of the design described and possible alternatives were raised in the report “The Limits to Growth”, which although it contained some inaccuracies, raised doubts about the sustainability of the conventional system (39).

The first approach has been with information, evidence enriched showing that the technology promoted by conventional agriculture has occurred in at least some areas of the globe heavy pollution of surface, and groundwater has increased soil erosion resource, have appeared forms of resistance in pests, and begin to register pesticide residues in certain foods. From the energy point of view, conventional agriculture exhibits a strongly negative energy balance (32).

From this diagnosis have been proposed various technological alternatives with different semantic variations (sustainability, sustainability, organic farming), try the more or less extensive raising new management systems that eliminate or reduce the manifestation of the processes set out above (2, 46).

With this approach, programs in the US and in Europe have been implemented Europe under the generalized acronym (LIFE), LISA, and Financial instrument for the environment, among others. In Argentina, the Conservation Agriculture Project (CAP), launched several years ago by the National Agricultural Technology Institute (INTA), it is part of the same trend. As a rule, these programs attempt generation technologies that allow obtaining similar levels of production or somewhat lower than the current, long-term sustainable and with a substantial reduction in some cases 50 % in the use of agrochemicals, fuel and tillage (47, 48).

It is clear that the new approach does not mean a return of the methods prior to the Green Revolution, but in a selective combination of the practices provided by modern technology (27).

Taking into account that ecosystems under cultivation now occupy almost two-thirds of the earth's surface and contributing 20 % of the net productivity of the planet is clear that the role of farmers and technicians who take and run decisions in such a system is a wingspan greater than that of any other social group in the world (26).

Therefore, the rethinking production processes necessarily requires producers and technicians with a very good level of knowledge about the system in which they operate. In short, decision-making and implementation of measures and practices for the sustainability of agricultural systems is a matter of high technology (14).

In this context, management of animal and plant pests is central. As mentioned in the beginning, weeds are part of a highly disturbed state and in initial stage of secondary succession ecosystem. The weed growth also has different characteristics from conventional secondary succession (49):

a) There is an energy subsidy system (fertilizers, fuels, agrochemicals).
b) There are certain periodicity and recurrence disturbance (tillage, herbivore)
c) The system produces information (modifications heat or light environment) which is captured and stored by the bank of soil propagules.

The bank of propagules, seeds, fruits, rhizomes, stolons, tubers and any other form of propagation is the linchpin of the regeneration process of vegetation. The study and understanding of how spontaneous populations that recurrently appear after soil removal or installation of a crop are the reason for this course: as has been said over weed not a particularly botany class but it is a spontaneous plant population, which exhibits characteristics for a system in a given place and time (35).

The treatment of the weed problem in crops under a short-term perspective and largely ignoring the characteristics that exhibit spontaneous populations, has taken not only the ecological studies applied to agroecosystem but the implementation of strategies supported based on ecological theory available (50).

Therefore it is urgent not only convergence but also the deepening of studies and dissemination of knowledge gained in agroecosystems in order to optimize efforts and match them with the challenges of sustainable agriculture (14, 48).

WEEDS: SUCCESSFUL PEOPLE IN THE AGROECOSYSTEM

Weeds are a special form of highly successful vegetation in agricultural environments as plant populations are growing in environments disturbed by man without being seeded. From an ecological point of view, weeds can be located within the pioneer of secondary succession. In the agroecosystem, the most critical impact of weeds is the negative effect on cultivated plants exercised through competition for limited resources and allelopathy. Disorders in the collection and packaging of grains and decreased forage quality are additional damages in many systems (26).

From the evolutionary point of view, generally it involves the sustainability or continuation of the genetic line over time. Thus, the evolutionary success reflected by the number of individuals, reproductive capacity, area and range of habitats occupied by the species in question. The understanding of the concept of success in the agro-ecosystem is necessary to explore the nature of the weed growth and lay a solid foundation of management in production systems (4).

DEFINITION OF SUCCESS

The most successful weeds in agricultural ecosystems are considered often more problematic. Success measured, in this context, depending on the speed of colonization, the difficulty of disposal and the negative effect on the productivity of cultivated species.

In general, most of the characteristics of a plant, which contributes to high capacity and competitiveness colonization, corresponds to those exhibited by weeds, and in a much greater extent than the exhibited by the cultivated species (9).

ADAPTIVE STRATEGIES OF WEEDS

A commonly used by ecologists in order to understand the relationships among organisms and their environment approach is to compare their adaptive strategies. Populations adapt to the environment by balancing allocation and resource and energy partition between physiological processes and biomass components throughout the life cycle (51).

In other words, there must be a compromise among the resources allocated to compete successfully in this (biomass allocated to vegetative structures) and those who are for the future, i.e. the offspring (biomass assigned to seeds). In this concept the idea of "reproductive value" emerges a central issue in a successful population: the feature set of life history that maximize survival (lx) and playback (Bx) configure the adequacy (= fitness), in a particular environment. Weed populations exhibit a high or maximum adjustment (20).

The r-K selection

A widely accepted theory and concerned with evolutionary specialization strategies is the r-K selection. While selected r organisms are adapted for colonization and reproduction in unpredictable environments, selected K organisms are adapted to the persistence and reproduction in stable environments. R selected populations occupy the initial stages of succession, however the K populations selected mostly occupy the late stages of succession While many of the weed populations exhibit characteristics of strategy r, other populations may be located within K and in many cases the populations exhibit characteristics common to both being located in a continuum between r and K (7).

C.S and R selection

An alternative hypothesis was suggested in relation to the adaptive strategies to define more clearly, the role of environment in determining the success of the plant. Where it was proposed that the external factors that limit the amount of biomass that can be generated in a given environment could be classified into two categories: the first is the stress and the second is the disturbance (52).

While these two factors vary among habitats, extreme cases can be combined in such a way that result in three habitat types and three possible combinations of evolutionary strategies. Competitive maximize resource capture in highly productive and undisturbed conditions. They are abundant during the early and intermediate stages of succession. Stress-tolerant plants are long-lived adapted to live in conditions of limited productivity and often occupy the late stages of succession (52, 53).

Ruderals, herbs are often very short-lived with high seed production and occupying the very early stages of succession. In order to include secondary strategies occurring in intermediate habitats linked to the ends as described, a triangular model is proposed: the three extreme strategies - competitive - tolerant stress (ruderals are located at the vertices of the triangle) (36). In this way and based on the study of a number of species, many herbaceous weeds including annual, biennial and perennial and some crops have many competitors and ruderals common characteristics can be classified as competitive-ruderal. These plants are characterized by rapid growth, rapid capture of resources and high seed production (30, 54).

COMPETITIVE ABILITY

The preceding sections have shown that weeds are adapted to the agricultural environment through a number of strategies that maximize rapid growth and reproduction prolific in disturbed habitats. These features also contribute to its competitiveness. The competitive ability of weeds is a complex function which features combine resulting in a rapid depletion of resources needed for cultivation (4).

Certain features are recurrently associated with competitive ability. Among them included a large amount of accumulated bodies of vegetative propagation or storage leading to a rapid expansion of foliage, an air system and underground vigorous and fast growing that allows book a rapid exploitation of environmental resources and both lateral and horizontal expansion resulting in a very high density of stems and roots.

Phenology is another feature of the competitive ability (55).

FEATURES WEEDS ASSOCIATED WITH ECOLOGICAL SUCCESS

Classification and characteristics the cosmopolitan weed

If we consider a 250 000-plant species within the flowering figure, less than 250, are considered important in large parts of the planet. Of these about 70, are considered “the worst in the world.” These 70 species are distributed in 30 families, but nearly two-thirds are located in eight families and about 50 % are located in only two families: Poaceae and Asteraceae

The low number of weed species considered in relation to the total, exemplifies the phenomenal selective pressure occurred since ancient times (55).

Of the 30 botanical families that contain the world’s worst weeds, five of them Poaceae, Solanaceae, Convolvulaceae, Euphorbiaceae and Fabaceae also supply 75 % of world food. This observation implies that the crops and weeds taxonomic share common characteristics and evolutionary origins. Described below physiological characteristics echo plants exhibiting humans designate as weeds (35).

Features of generative phase

The events that happen in the regenerative phase of plants (seed dispersal, dormancy, germination and seedling establishment) are particularly important for weeds in agricultural environments (33).

Seed dispersal in space

The dispersion is propagule spread of a plant from one location to another. The significance for an organism of this process depends on the environment. Both weeds and other species that make up the series, continued survival depends on escape and establishing new areas that may be more benign for survival that occupied by his father. Besides the number of seeds that each individual produces, other important factors that determine the number of seeds that fall per unit area are the dispersibility of seeds and the activity of the dispersing agents (33, 35).

The dispersibility is a function of the characteristics of seed that include appendices on the seed or fruit. Many common weeds have very specialized forms of mechanical dispersion, while in others the seed is driven by various mechanisms voltage occurring in the fruit. Examples of these mechanisms are in Oxalis corniculata L., Erodium sp. and Avena fatua (34).

The most common form is the passive scattering, which increases the activity of dispersing agents such as wind, water, animals and man. In some cases, agents of natural dispersion are the main mechanism (case of wind and provided seed pappus in *Carduus* sp., Very light as in the case of parasitic *Orobanche* sp., or transported through the whole plant, such as of Salsola kali) human activities are the most significant contribution in this regard. Planting uncertified seed purity, lack of cleaning tools and implements of tillage and harvesting, the transfer of finance and irrigation water are among other major routes of dispersal and invasion of weeds into new areas. The rules, regulations and laws relating to health implemented by governments around the world aim to reduce this effect (9).

Dormancy and germination of seeds

Most successful weeds have pronounced prolonged viability and latency, allowing survival in harsh conditions for plant growth and persistence for long periods in the soil. Latency can be defined as a state in which seeds or viable buds not germinate even though there are conditions of temperature, humidity and adequate concentration of oxygen (28).

It is called germination process by which the embryo growth resumes, resulting in its emergence through the covers of the seed or fruit. Latency is considered the primary factor contributing to the continued presence of weed seeds in agricultural soils. In contrast, the latency has been eliminated by breeding in most crop species such that a synchronous germination and emergence occurs (4).

A seed germinates sleep or depends on a number of factors related to the characteristic of the seed and environmental factors. These two components interact such that dormancy and germination are synchronized tightly with the environmental change processes.

Environmental synchronization provides seed survival increased security, since germination occurs at the time when environmental conditions are favorable for growth (31).

Latency is highly variable and even among the seeds of the same plant characteristic. This somatic polymorphism ensures the continued survival of the species by reducing the risk of total loss in the event that the conditions after germination are unfavorable for the establishment. Polymorphism is very common in families Asteraceae, Brassicaceae, Chenopodiaceae and Poaceae (4).

While latency has been studied in detail in many species, the physiology of this process is not fully understood. Generally, it can say that dormancy and germination are highly complex and interrelated processes that are controlled by biochemical, physiological and structural factors (41).

The role of the environment in the regulation of seed dormancy and germination release is when extends to the ripening period when the seed is developing in the parent plant. The seeds that are dormant when emerging from the plant are designated primary inborn or latency. Innate latency can be caused by immaturity or excess moisture in the embryo or ripening requirement conferred by a special regime of temperature, light or stratification (35).

The seeds that do not germinate due to the restriction imposed by an environmental factor are designated as quiescent or latency imposed. Non dozed and entering latency after dispersion often in response to environmental conditions which inhibit germination are considered induced or secondary dormancy. Which they are present in the soil profile have latency/no latency cycles that promote germination during the most favorable for the development of the seedling period. This complex strategy can be exemplified by the behavior of Ambrosia artemisiifolia, a species of early successional stages (28).

When seeds fall asleep down they are then germinated always the winter when the soil stratification and it is disturbed and the seeds are brought to proximity of the soil surface. The seeds that do not germinate can be induced to a secondary dormancy. This latency can be deactivated by another cycle lamination (4).

Germinating weeds and other species of early succession often require light to germinate but they are inhibited by light filtered and vegetation (far-red) and promoted by fluctuating temperatures. These conditions are fulfilled near the surface of the bare soil where irradiance levels are high and high temperature ranges. Seed germination of weeds is also greatly diminished with depth where oxygen levels are low; there is an absence of light and lower temperatures (56).

Most weed seeds germinate better to depths of 0,5 to 2 cm. Adaptation to germination near the surface ensures the availability of resources and reduces the likelihood of competition with germination species and later establishment. Thus, the crops, seeds that bring located deep in the ground to the surface (28), promote the weed seed germination.

A common management practice is to bring seeds from the deep to the surface layer by tillage, expect the occurrence of rain in rainfed or irrigated field in irrigated areas before planting removing seedling weeds with new tillage or herbicides. Backwards, with minimum tillage systems, the absence of disturbance of the soil profile ensures that the seeds remain in the deep strata, where unsuitable conditions for germination are generated (35).

Germination and seedling establishment

When latency concludes, the normal sequence of events leading to the emergence of the radicle, underground taproot growth, the emergence of the stem above the ground and finally the establishment of the seedling. The establishment concludes when the seedling is able to perform an independent growth of reserves of the cotyledons. The emergency most dicots is epigeous, ie cotyledons are raised above the ground surface. In the hipogea emergency cotyledons remain below the soil surface. After the emergency, the cotyledons quickly acquire their status photosynthesizing organs and leaf area rapidly enlarges (41).

It has been proposed the concept of “safe place” and it is defined as the area in which suitable for germination and survival conditions are. The secure site then provides not only stimuli to unlock dormancy and promote germination but also the absence of dangers like predators, competitors, pathogens and toxins (33).

For the purposes of managing weeds, it is imperative to distinguish plantlets seed or vegetative buds expressions derived from vegetative propagation organs such as rhizomes, stolons or tubers. Seedling represents the most vulnerable in the life cycle of the plant stage and it is generally the easiest to be destroyed either mechanically or herbicides (4).

Characteristics of stage set

The established phase of plants involves numerous functions related to the capture of resources, growth and reproduction. The events of this phase are the major determinants of competitive success and survival in the agricultural ecosystem. In terms of reproduction, weeds of agroecosystems have systems variables and general genetic exchange, produce plenty of seeds for a long period of time and vigorously reproduced from fragments if they are perennial. These features contribute significantly to success in disturbed environments (34).

Emergency order and initial capital

The success of a plant is associated with the speed with which the processes of germination and the speed with which additional biomass is generated start. It is shown that the seeds that germinate first and having higher initial capital (older embryos or tissue accumulation and abundant reserves) have a distinct advantage over individuals later or less initial capital germination. As explained below, the occupation of space and capture limiting resources are the key to a successful population in the establishment phase (32).

Growth and resource capture

In general, individuals that grow faster than their neighbors use a disproportionate share of available resources, to the detriment of those. Relative Growth Rate (RGR) has been used as a means to integrate physiological characteristics in a common value for comparing different species (57).

Several authors determined the rate of potential growth for 132 species. Annual plants often have higher RGR values regarding woody plants. In terms of adaptive strategy, both competitive as ruderals have RGR high. This feature is highly correlated with an opportunistic exploitation of disturbed habitats and also a general trend among the species of early successional stages (58).

An important component of plant growth is the photosynthate partition towards generating additional leaf area. In a study by different authors it demonstrated that the partition leaf area or the expansion rate of new leaf area was highly correlated with rapid growth. Other research showed that growth parameters related to the seedling size and leaf area were the best predictors of competitiveness in mixtures weeds. It is clear that the rapid production of leaf area, which results in rapid canopy development, it is critical to the success of both weeds and crops in the agricultural environment (57).

And, in the regenerative phase, the phase established events are closely linked to environmental factors. Resources, including light, water, mineral nutrients, CO_2 and O_2 are environment factors consumables t that can limit growth when they are absent or deficit. In contrast, while environmental conditions such as temperature, pH and soil bulk density are not consumed, they have a crucial influence on the processes that determine the growth of the seedling.

The differential ability of plants to extract resources or to produce different responses to environmental conditions are the main determinants of competitive success among species (59).

The processes of particular importance to the success of weeds in agricultural environments include efficient use of CO2, quick and efficient absorption of water through the root system, the high efficiency of water and morphological and physiological plasticity in relation environmental changes (57).

Photosynthetic cycles

based on their photosynthetic cycle, plants can be divided into three main groups. These include C_3 (Calvin-Benson cycle), C_4 (Hatch-Slack cycle) and CAM (60).

While each of these three groups can be found at various weeds, the major weeds represent the C_4 via. Other studies have shown that only 0,4 % of the flora has this additional way of incorporation of $CO_{2.}$ Of the 76 most important world weeds 42 % use the C4 via and 78 % of the 18 most ubiquitous and aggressive weeds are C_4. A similar study has shown that 16 species are cultivated C_3 via (61).

Plants have the C_4 via generally have rates higher than net photosynthesis C_3 plants. The enzyme that initiates the CO_2 fixation [PEP (carboxylase phosphoenolpyruvate)] has a higher affinity for CO_2 than the RuBP (ribulose diphosphate) carboxylase, the enzyme that initiates the CO_2 fixation in C_3 cycle. C_4 via in CO_2 is concentrated in mesophyll cells and can keep high rates of photosynthesis, even when the stomata are practically closed or when the concentration of CO_2 in the air is low. Moreover, given the high concentration of internal CO_2, photorespiration decreases substantially, this contributes to achieving high rates of net photosynthesis. It should finally be pointed out that in C_4 plants actually work both combined cycles, the Hatch-Slack acting as a reservoir of CO_2 cycle set (60).

The high efficiency of photosynthesis is often correlated with rapid growth, which may confer a higher competitive ability. This led to classify plants according to efficiency criteria or not based on their photosynthetic efficiency characteristics (C_3 = inefficient, C_4 = efficient.

Subsequent research has detracted generality of this idea, since C_3 species are highly competitive. It is that other factors combine to determine the competitive ability of a plant. For example, for most C_4 plants the optimum temperature for photosynthesis and growth is higher than for C_3 plants. In more temperate habitat thermal conditions the advantage of C_4 species is not so, not only because the total photosynthetic rate is lower but also because the coupled C_3 - C_4 via has a greater energy requirement to run.

In characterized by high temperatures and water stress agricultural environments most likely most annual and perennial weeds summer will belong to the C_4 group, while winter annuals are often species C_3 (60).

Water absorption

Besides the seasonal supply water, plants can regulate the availability of water in any environment through a number of mechanisms and processes. These, are the development, structure and distribution of the roots, tolerance to low potential of water in tissues, control water, loss by transpiration and efficiency in water use (WUE) (62).

In one of the first work related to the structure of roots, it was shown that after 20 days of emergency most of weeds have radical systems and greater absorption surfaces higher than cereals with which they compete. The development of the root system is the main factor contributing to exploitation of soil moisture and associated nutrients, thereby imparting a higher competitiveness (63).

The physiological control of the availability of water for the plant can be expressed as efficiency in water use (WUE) it is expressed by the amount of CO_2 fixed or the amount of dry matter produced per unit of water lost through perspiration. Already in 1913, it was reported that plants differ significantly in their water requirements. Subsequently it was determined that the highest WUE values were in C_4 species while C_3 species had relatively lower values (41, 60).

Higher values of WUE, in C_4 plants in relation to C_3 are due to the conservation mechanism of C_4 via. Thus, C_4 plants are more productive than C_3 when water is limiting (64).

The competitive advantage of a plant with high value of WUE due to the C_4 via is not always so obvious. It has been shown that in some situations, plant maintains high stomata open and transpiration rates under stress can control water availability greater extent than a plant WUE higher value and more sensitive stomata to stress. This was found in the case of mixtures of Chenopodium album L. (C_3) with Amaranthus retroflexus L. (C_4): high values of WUE of A. reflexus not confer adaptive advantage on Ch. Album (62).

Thus, rapid root development associated with excessive water use contributes significantly to both weed growth and competitiveness. The advantage conferred by the C_4 photosynthetic via and associated WUE high values that have been found in many weeds would be important in warmer, dry, with high irradiance and where they occur very frequently water stress (57) situation.

An additional issue is demonstrated in the case of Xanthium sp., A very common weeds in soybean cultivation and has been found both in vegetative stages as reproductive crop, the level of potential xylem water is always more negative in Xanthium sp. In parallel, the process of the crop genetic improvement, which has been nesting grain production seems to have neglected this aspect; an analysis of the cultivars recently exposed to the US market allows verify that the xylem water potential and range of flexibility in stress situations is lower than in cultivars released two or three decades ago (60).

Plasticity and environmental answers

Agricultural environments which are weeds are often very disturbed systems in which the soil appears highly exposed, not covered with extremes of temperature on its surface and significant fluctuations both moisture and nutrient levels. These changes usually occur unpredictably (64).

The best weeds adapted to these conditions are tolerant to some variable conditions such that can grow and reproduce successfully. To this tolerance to environmental variation is designated plasticity (45).

The plasticity is the capacity of a phenotypic adjustment, translated in morphological changes and changing conditions. Baker found that weeds have a genotype of all or multipurpose use, which in other words implies the existence of a wide range of exhibited characters by a limited number of genotypes (22).

There are different ideas on this point. Rather, it can consider weeds as populations containing genotypes. They respond to a high degree of specialization and a degree of adjustment very fine, to a supply of signals that makes the ecosystem under cultivation (55) What is unquestionable is that the cultivated species have been subject to an intensive process of improvement and through the, have lost morphological and physiological flexibility to respond to environmental changes (4).

An outstanding example of plant plasticity is the variation in the number of parts or modules. Other visual changes include the time among various stages of the growth cycle (emergency - flowering or flowering - maturity), the type of seeds that produce (level of latency), the relative size and distribution of the roots and leaves. Variations in the number, size and distribution of overhead and underground plant parts plastic responses reflect the allocation and photosynthate partition. All these processes confer a weed capacity for rapid response to sudden changes in the distribution of habitat resources (32).

Weeds also exhibit a response to the density plastic. Density imposes increasing stress among plants because of declining environmental resources, an issue that is magnified to the extent that plants grow. As the plants grow, the dense dependent mortality and the consequent increase in size of the survivors - Plastic growth - leading to a situation where they survive few individuals but very large. Overall, it can say that this is a process of wide occurrence and is designated as Auto thinning Law or if we refer to the linear model: -3/2 Law (65).

Due to of these processes, there are situations where there are many individuals but small and others where there are few but larger. The expression of plant biomass per unit area leads to another generalization: in a wide range of densities, biomass per unit area is constant (Final Performance Law Constant) (33).

Flowering and Seed production

The weed improvement system is one of the crucial components of success.

Most weeds exhibit a high level of inbreeding either through self-pollination (selfing) or by agamospermy. However, in all of them there is a level of outcrossing, which allows the exchange of genetic material with other populations. Wind or generalist flower visitors rather than specific pollinators generally produce Allogamy (36).

This combined system leads to the production of stable duplicates of parent genotype but arisen recombination and genetic variability wide. The advantages of this combined system are obvious: the testing of a genotype wide range for the purpose that one achieves success and subsequent rapid advance the most suitable genotype. This scheme is even more efficient in species with vegetative propagation (S. halepense, for example) (66).

Weeds are characterized by abundant and continuous production of seed under different environmental conditions .Also density plays a crucial role in the production of seeds for each individual: fertility is a strongly density dependent attribute.

Two weeds studied in detail in Argentina, as Amaranthus quitensis and Datura ferox clearly show this response. In the latter case, this population characteristic, associated to the design combines, causing redispersion of weed seeds in the field, may explain the presence of Datura ferox (jimsonweed) in batches of soybean even when the efficiency of herbicides used to control is very high (66).

SPECIAL FEATURES OF PERENNIAL WEEDS

Most of weed attributes previously described, apply to perennial weeds, such as very prolific species as *C. rotundus.* The vigorous vegetative reproduction and regeneration from fragments constitute another feature mentioned by Baker in his list of attributes of the ideal weed (33).

The significance of vegetative propagation in the original list is important; 61 % of the 18 worst weeds exhibits some form of vegetative propagation. As explained before, vegetative propagation has the same effects as the selfing or backcrossing, the result of both processes is a rapid multiplication of individuals with genotypes suitable for the environment in question (55).

The balance between vegetative propagation and breeding by seeds in any species is highly dependent on environmental conditions, including density. In the case of species with both sexual and asexual means multiplication, as in S. halepense, selective combination of the two processes, exhibit a very efficient complementarity: sexual reproduction is significant at the stage of colonization or resettlement of pest in the field and vegetative propagation multiplies very quickly the most successful genotypes (31).

Plants reproduced vegetatively have specialized structures that can survive in low temperatures, some level of drought or other unfavorable conditions. When these structures are located below the ground surface, they are very persistent and robust. The role and significance of vegetative reproductive structures is twofold: firstly, produce buds or meristems that can generate stems and roots and other tissues serve as a storage and carbohydrate reserve (4). Often, more than one type is on the same plant. These structures include stolons, rhizomes, tubers, shoots, bulbs, corms, crowns and gemmiferous roots. *C. rotundus*, for example, has rhizomes, corms and tubers. Of these, the latter contributes significantly to the spread of weeds (28).

The competitive ability of a perennial weed is significantly increased by the amount of carbohydrate reserves stored in underground structures. The rapid expansion of the canopy, the main factor contributing to the competitive ability of many perennial weeds, occurs due to the mobilization of energy reserves and structural materials accumulated in the organs originated reserve in the previous growing season. These pre-existing reserves allow rapid emergence and growth of young stems and have a competitive advantage over those from seeds, generally smaller and less capital (33).

The amount of carbohydrates stored in underground organs varies in relation to the time of year. In the most unfavorable times is a decrease due to consumption by maintenance respiration and in the early stages of budding because of supply young growing stems. In good times, the aerial system produces photosynthates that are transferred to new underground structures (67).

The study of variations in the air level and ground biomass and carbohydrate is of great interest not only to understand the processes of weed-crop interaction but also to increase efficiency in control practices. The search for predictors easily measured for these variations are lines of work of great practical importance (35).

Vegetative propagation may be accompanied by a fragmentation of both aerial and underground organs (stolons and rhizomes of *Cynodon dactylon* L.). The division of the vegetative structures can occur spontaneously due to the death of the connecting tissues, the death of the mother plant or tillage, no doubt the latter event is most efficient to disperse the weed propagules. After separation, the plants that are vegetative propagules of each are clones of the parent plant thus achieving a horizontal spread of genotype (52).

In some cases, the vegetative propagules exhibit latency or inhibitory phenomena correlation (apical dominance) occur, but in most, the growth absence of buds or meristems is associated with environmental restrictions (drought or temperature). In the case of temperature, there is a threshold of variable sprouting for species and even ecotypes (68).

Whatever the specific mechanism, the regenerative structures of plants that store reserves and that have the capacity to vegetatively propagate, are significant components in the weed problems of agroecosystems.

MANAGING OF WEEDS

although weeds reduce crop yield, their presence contributes to the stability of agroecosystems. For this reason, it is considered interesting to apply ecological methods of farming systems analysis in order to understand the distribution patterns and abundance of weed species, as they have done (69-71). Ecological studies open a new line of research in the development of management systems designed to control seek alternatives that allow getting a good agricultural production without undermining ecological services. The best use and understanding of the diversity of weed at the regional level can be the key to maintaining the production of traditional rice fields in Thailand (72).

To develop an appropriate weed management in sustainable agriculture, it is necessary to include basic research in biology of weeds. These studies establish the fundamental to better understand their population base, growth and development, interactions with biotic and abiotic agroecosystem aspects, phenology, interference with crops, allelopathy and adventitious potential competition (bank of seeds) (3).

This will help properly the management strategies of weeds, especially conducive to make the decision to carry out a specific method of reducing weeds and avoid negative effects on crop quality and yield. On the other hand, prevention is a factor that is considered little in the management of weeds; this should include the use of crop seeds not contaminated with seeds of weeds, cleaning tillage equipment and tools, proper management water for irrigation and animals to prevent the spread of seeds in the field and the legal prevention (72).

Cultural management of weeds often mentioned as an important component in controlling weeds; however, it is not fully executed. In an alternative agriculture, cultural practices must be combined to ensure success. These should include tillage systems, the use of good quality seeds or force, proper planting time, high density, timing of agronomic methods, dead and living mulches, association, sequence and rotation crops (5).

Unfortunately, today, many of these practices are not observed in the fields of small and medium producers, due to the implementation of modern agriculture, which boosted the irrational use of chemicals. However, it is necessary to recover and keep them, if you really want to develop agriculture with less impact on the environment (2).

Perhaps the findings made, serve as reflection when we say that a historical perspective on the methods that perform the peasants are valuable to learn how today we can better conserve energy, conserve resources and reduce the excessive use of chemicals in agriculture (6).

Some authors mention that some of these practices not only help biocontrol agents to act more efficiently, but also to conserve soil and make the agroecosystem less dependent on fertilizers, herbicides and other agricultural inputs (49).

In the transition to alternative farming with small farmers, herbicide use can play an important role in managing weeds. However, it should not be the center of a weedy program but part of a system that includes other methods and orient the rational use of doses, the type of herbicide appropriate to the situation and rotations (72). In addition, this technology offers a possibility for integration programs more stable handling, for which one must consider the ecological and environmental concerns in the use of herbicides (73).

Undoubtedly, if you want to implement management systems with a lower impact on the environment, incorporating joint actions of prevention, cultural management, mechanical cleaning, and plant genetic, biological, chemical, political aspects, socioeconomic and training of farmers is required.

THE BUENAZAS

It is the terminology that has been used in organic farming to rescue the name and the importance of all the friends and companions plants growing among the crops commercially not represent any interest for conventional agriculture and which are misnamed as “weeds, grasses and super weeds.

The “buenazas” are plants that grow naturally between the spaces of cash crops; they, like other plants contribute to coverage and soil protection, with the most efficient recycling of nutrients, with increasing organic matter and improved soil structure (4).

In organic agriculture is desirable that naturally maintain different levels of “buenazas” between crops, as one of the efficient ways to retrieve and promote monitoring of plant biodiversity and create conditions for greater diversification of entomological fauna, important factor in system stability (38). In this type of agriculture, they are appropriate to the management of “buenazas” practices, highlighting the mechanical practices, scuffed and manual pruning in the most appropriate times. Plants are also used to reduce allelopathic effects increase “buenazas”, mainly through green fertilizations and dead cover, among others (48).

UTILITY OF WEEDS

Not only the aspects mentioned above should be included in the management of weeds in sustainable agriculture, it is crucial to consider the importance and the benefits they provide in agroecosystems (Figure 1).

The current perspective on weeds is the plant succession result in modern agriculture, product disturbance environment that favors the specialty of competitive weeds. Although volunteer interfere with agricultural production plan, some species are important biological components of agroecosystems, so they are considered useful elements in land use systems (4).

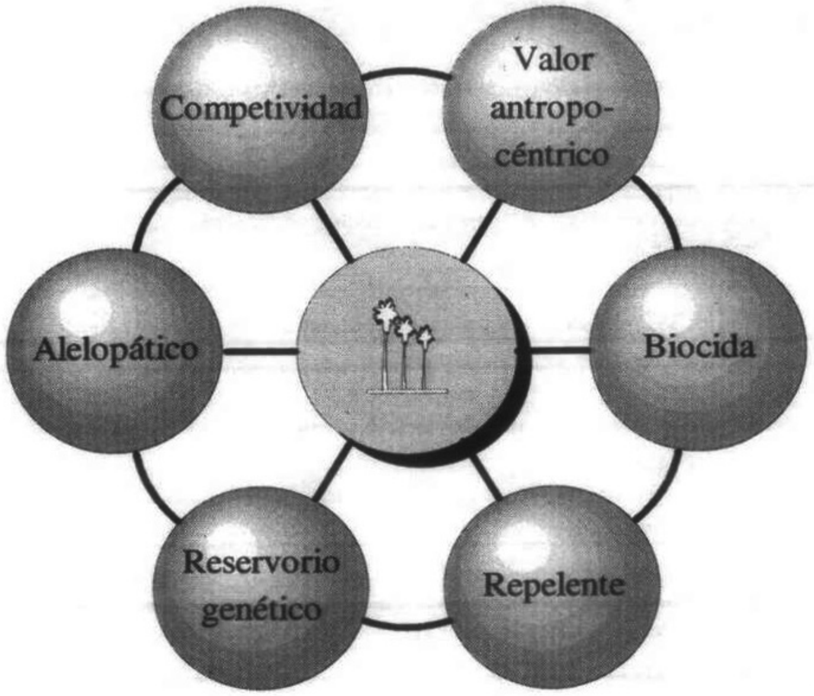


Figure 1. Effects and usefulness of weeds

Weeds interact ecologically with other subsystems of the agricultural ecosystem and they are very important against erosion and soil conservation, formation of organic matter, nitrogen fixation in the soil, preservation of beneficial insects and wildlife (74, 75).

Certain weeds should be regarded as important components of agroecosystems, because they can positively affect the biology and dynamics of beneficial insects. Weeds offer many important requirements to natural enemies such as pollen or nectar alternatives guests' prey, plus micro habitats that are not present in free monoculture of weeds (9).

In Mesoamerica there is a great diversity of species with anthropocentric value, of which farmers have a broad biological knowledge of plants that are part of the ecological environment (76). This knowledge leads to the selection of numerous species for human consumption, domestic animals and control of other pests of cultivated species (5). Also, weeds have great interest in science, to increase genetic diversity and entomology and plant pathology work as sources of repellent substances or biocides (77).

The small and medium farmer pequeño y mediano agricultor in Central America is characterized by the correct use of limited resources of their farming system; this also includes the management of weeds. Contrary to the previous approach, intensive and excessive farming in the use of inputs aims to achieve a high yield of crop species; this means the total elimination of weeds, causing loss of species with scientific value and usefulness potential for man (5, 76).

In Guatemala, farmers recognize the competitiveness of weeds in the initial part of the crops, which anthropocentric widely used in different regions. They make clean of weeds in the critical period, so that after this weeds grow and be used, if not they develop selective weeding and allowed to grow on par crop those weeds that have for them a value in human food, animal or medicinal use (3).

In Mexico, farmers consume about 40 species associated with cornfields as vegetables and some of these species are allowed to spread their seeds to enhance growth (6).

Definitely, weeds play an important role in the fields of a vast majority of traditional tropical farmers who make intensive and varied use of these. Some weeds that are used for human consumption are Bidens pilosa L., Solanum spp. and Portulaca oleraceae L. For pet food Melampodium divaricatum (Rich) DC., B. pilosa, Cynodon dactylon (L) Pers., Cynodon nlemfuensis Vandeiyst., and Setaria spp. (5).

For medical use, used as eye drops to Argemone mexicana L., Asclepias glaucescens L., Cleome viscosa L., is applied as a disinfectant, Chenopodium ambrosioides L for postpartum bathrooms, Rumex crispus L. as an anthelmintic, to laxative. Other species have ornamental value as Commelina spp. and marabou Cailliea glomerata Forsk .; also they have good protection of land against erosion. For bird feeding seed, Rottboellia Mexican A. cochichinensis (Lour) W.D.Clayton is used.

Weeds also are very important as a genetic reservoir of cultivated plants. The tomato is a classic example of a cultivated plant that has been improved by hybridization with related wild species (78).

Another important aspect of weeds in an agroecosystem is the action they have on some insects such as Eleusine indica (L.) Gaertner., which regulates Empoasca kraemeri (Ross & More) by chemical repellency or disguise, S. halepense, decreases Eotetranychus cuillamettei, because increases predatory mites (9). Amaranthus viridis L., Boerhavia erecta L. and *Cucumis foetidia* L. are alternate aphid hosts and thus considerably stop the transmission of viral diseases (79).

In addition, species belonging to the family Fabaceae are very important, being carriers of Rhizobium nodules that enrich the soil with nitrogen. In Costa Rica, studies indicate, harm reduction that produce insect pests, mainly Diabrotica spp., on legume when left Amaranthus spinosus L., line in between entre linea. While in Nicaragua, the armyworm S. frugiperda, caused major damage in young corn plants in a free habitat weed, it was reduced when there was coverage weedy, consisting of a greater abundance of monocots and *C. rotundus*, *S. halepense, Panicum* spp., *Rottboellia cochichinensis* and *Setaria* spp. (23, 80).

The diversity of agroecosystems, benefits the variety of parasitic insects predators. Diversification practice must be performed using different crops and the use of weed populations within the crop or edges, to act as insect repellents or crops traps (81).

Similarly, weeds are important as sources of extracts used for the production of pesticides. B. pilosa affects nematode populations, Ch. Ambrosioides, acts as an insect repellent. It is stated that substances extracted from *Tithonia tubaeformis* (Miller) Blake and *T. diversifolia* are poisonous against diamondback moth and Lantana camara L. acts as a repellent on the same plague (79).

Finally *C. rotundus* is considered one of the most undesirable weeds in the tropics, even so, this species develops its root system can play an important role in areas susceptible to erosion. In addition, it may produce allelopathic substances, have a potential as a pesticide (80).

The approach outlined above on weeds, indicate their ecological role in agroecosystems, its multiple uses from the biological point of view and the utilitarian value that give small farmers in Mesoamerica. This, calls for reflection on the qualities of weeds, especially for those scientists and technicians who wish to develop sustainable agriculture.

There remains the hope that large farmers and peasants as ecologists are not quarreling about the word weed or beneficial plant but try to find ways and sources to ensure high and stable yields also in sustainable agriculture in the tropics.

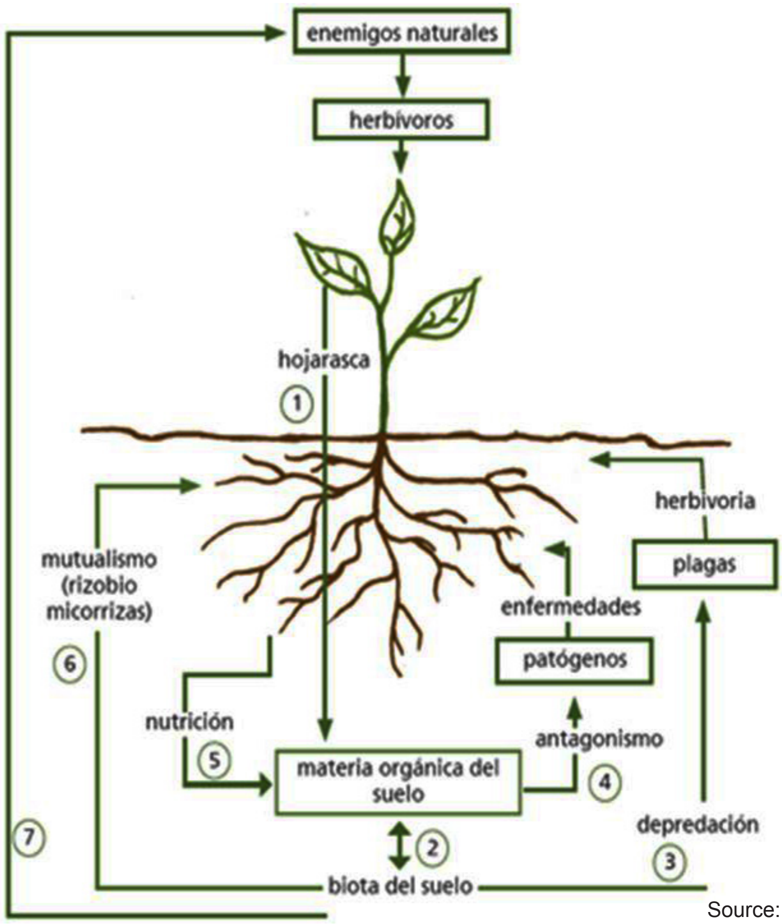
DIFFERENT CONTRIBUTIONS MADE WEEDS IN AGROECOSYSTEM

Contributions to edaphic balance

Practices to improve soil fertility can directly impact the physiological susceptibility of crops to insect pests, either by affecting the resistance to attack of individual plants or by altering the acceptability of some plants to certain herbivores (2).

Several studies show that the ability of a culture to resist or tolerate attack insect pests and diseases is linked to the physical, chemical and biological soil properties particularly. Soils with high organic matter content and high biological activity generally exhibit good fertility as well as complex food chains and abundant beneficial organisms that prevent infection. On the other hand, farming practices that cause nutritional imbalances such as excessive application of synthetic nitrogen fertilizers, lower the resistance of plants to pests (81).

The plants operate in a multi-trophic complex environment, where generally the flora and fauna of the soil and above soil organisms (crops, insects, etc.) interact in complex food webs, with a series of interactions that may favor or disfavor lower incidence of pests (Figure 2). Communities above the ground are affected directly and indirectly by interactions with the agencies of the soil food web (82).



Source: (83)

(1) plant residues increase organic matter content (OMC).
(2) OMC provides the substrate for the micro, meso and macro fauna of the soil.
(3) edaphic predators reduce soil pests.
(4) OMC increases antagonists that suppress soil pathogens.
(5) slow C and N mineralization that activates genes that promote crop tolerance to disease.
(6) mutualists increase N fixation, P intake, water use efficiency, etc.
(7) certain invertebrates (coloibolos and detritivores) serve as alternative food to natural enemies in times of lower incidence of pests.

Figure 2. Complex ways in which biodiversity on the ground interacts in the agroecosystem

Feeding activities of decomposers and detritus (mainly bacteria and fungi) in the food web stimulate the movement of nutrients, addition of nutrients by plants and operation of these indirectly influence the insects that feed on crops (83).

CONTRIBUTIONS TO BALANCE CHARITY ENTOMOFAUNA. ENTOMOFAUNA BENEFICA

The tolerance of weeds in cultivated fields and its surroundings are a challenge for farmers. Usually these plants are considered as weeds and therefore has been established to be removed; but it has been shown that they are not always harmful (competition, interference, reservoir pest) crops, but can contribute to soil conservation, food and shelter be beneficial arthropods among others. This means it has to be handled very carefully to promote the benefits and reduce the harmful (75).

The interaction among weeds and associated pests should be subject to proper understanding, for the better development of management practices of integrated pest management (IPM). Sometimes it is advisable to leave a small population of certain species of weeds, in order to ensure the important predator development of insect pests (26).

Practice has shown that weed control tends to reduce the incidence of pests. Although natural enemies vary widely in their response to the distribution, density and dispersion of crops, the evidence indicates that certain structural attributes agroecosystem (plant diversity, input levels, etc.) strongly influence the dynamics and diversity of predators and parasitoids (84).

Most of these attributes are related to biodiversity and they are subject to handling (associations and crop rotations, weed presence in bloom, genetic diversity, etc.). Based on the information available, the biodiversity of natural enemies and their effectiveness should increase in agroecosystems of the above forms (7).

CONTRIBUTIONS TO THE SOIL FERTILITY

In nature there are no “weeds” but if “adventitious and invasive” plants to be collected as ecological indicators. This is useful to understand the state of the physical, chemical and biological soil quality because these favor-making minerals by the plant elements, improve the physical, chemical and biological soil properties; Moreover, they provide growth-promoting substances for the plant (83).

Weeds play an important role in soil-weed relationship, because by ecological action - physiological of weeds, can be displayed as indicators of soil properties for different elements either phosphorus, potassium, nitrogen or humus (85).

Spontaneous herbaceous vegetation research conducted allowed to gather information from the ground where it appeared. For example, a ground dominated by stolon grass estoloniferas (which stems or stolons have along the soil surface, root nodes and produce new shoots), *Digitaria sanguinalis* as (L.) Scop M.. (Crabgrass or gramilla pasto cuaresma o gramilla), it had poor physical structure, that is, it was not a loose soil and therefore probably spent a lot of energy crop plant to settle, it being possible nutrient deficiency (Table I). Just as the weeds, pests indicating the origin of the difficulties plants were having, for example, lack of nutrients (Table II). However, these nutrients could be present in the soil more were not being utilized by plants, as in the case of blossom end rot in tomatoes happens due to lack of calcium in periods when the soil is too dry, not necessarily for lack of this mineral in the environment (86).

Table I. Indicator plants

Scientific name	Indicating
Oxalis oxyptera Progel	Clayey soil, low pH, lack of calcium or molybdenum
Portulaca oleraceae L	Soil well structured, wet and OM
Echinochloa crus-galli (L) Beauv	Anaerobic soil with nutrients restricted to toxic substances
Carex ssp.	Depleted Soil with extremely low calcium level
Amaranthus ssp.	Presence of free nitrogen (O M)
Sida ssp.	Very compacted soils
Bidens pilosus L	Average fertility soil
Pteridium aquilinum Kuhn	Excess of toxic aluminum
Cyperus rotundus L	Acid soils, thick, poorly drained

Source: (87)

Table II. Indicator insects sickness

Crop	Sickness or insect that appears	Indicates deficiency of
Beans	Whitefly, golden virus	Calcium
Corn	Cutworm	Boron
Corn	Jumping worm of corn	Zinc

Source: Primavesi (88)

The mulches are currently being included in agricultural systems with the purpose of increasing soil fertility and operation of long-term culture, from erosion control, increased organic matter and improving the physical properties soil, in the short term, affecting the radiation balance, temperature and soil moisture, nutrient availability, escorrentía- infiltration ratio and crop establishment (89).

Other contributions (retention moisture avoid soil erosion)

In the tropics, the use of weeds and soil protection is vital to reduce the effect of significant degradation factors such as insolation and the direct impact of rain.

The effect of weeds as ground cover cobertura vegetal on erosion can be divided into three types. The effect of type one, is on the vegetation cover offered by the canopy. The effect type two concerning plant cover contact directly with the ground surface and the effect of type three is on the incorporation of plant residues down depending on handling (90).

Drainage and agricultural tillage, accelerate deep percolation losses; removal of crops increases the amount of rainfall that reaches the ground and reduces evapotranspiration; changes in soil structure due to residue control tillage, crop rotation or use of fertilizers affects the rate of percolation and lateral flow.

The vegetation cover exercises one of the main controls of the accumulation of moisture in the soil, since influences inputs and losses carried to and from the soil moisture. For example, leave the foliage cut weeds as mulch reduces water loss from evapotranspiration and increases soil moisture content (45).

A soil capable of supporting an abundant crop production is a mixture of inorganic substances from the original substrate. The organic matter produced by plants and an intense life that transforms organic matter, making available to the plants a good part of the nutrients they need, partnering with them to facilitate nutrient uptake, reducing the loss of these on the ground and creating conditions for aeration, penetration and water retention in the soil (85).

GENERAL CONSIDERATIONS

For all explained above, it is necessary to continue to provide research to show that weeds which have always been considered as harmful for its interference in economic crops establishing a strong competition with them for light, water, nutrients, CO_2 and physical space. Production of harmful substances for growing space, also play a beneficial role in the agricultural ecosystem.

This means that it is necessary to establish rules of coexistence, through proper management of weeds in interspecific coexistence with crops, taking into account the critical period of competition (interference). It is shown that the presence of different species of weeds in crops maintains the composition of the beneficial entomofauna and, in turn, are more likely to find alternative prey, shelter, breeding sites and shelters dormancy as the agricultural ecosystem is more complex. Also managing weeds can determine the general ecological principles governing the dynamics of weeds and interactions of these in agroecosystems. Through further research, it can drill on specific combinations: crop-weed, in local agroecosystems to develop flexible guidelines in the design of agricultural systems.

Since it is known that plant diversity favors frecuencial way homeostatic mechanisms controlling crop pests. Soil erosion is controlled among others, presumably, the Insect diversity is greater and densities of phytophagous are lower and more stable in crops having different species of weeds. In crops without any plant diversity and, in turn, varieties exert some influence on these indicators, so that such practices may be used for regulating communities of pests in different crops and thus manage agroecologically agroecosystems, without resorting to chemicals.

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