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WATER, AIR AND SOIL REQUIREMENTS OF VEGETABLE PLANTS GROWN IN GREENHOUSES

C. Bodolan¹

¹ Transilvania University of Brasov, Brasov, ROMANIA, bodolan.ciprian@gmail.com

Abstract: Vegetable culture was one of the first practical human activities. However, with the advent of society have been continuously developed the knowledge and methods of vegetable plants cultivation, with very rapid rate in the modern times, which led to the consolidation of vegetable as a science of its own, thus detaching from plant growing, to which he belonged. Knowing the Ecology of vegetable plants especially presents a practical importance, because it is the basis for establishing and conveyance of culture technology.

Among the abiotic factors (climatic, geographic, orographic, edaphic) the greatest importance for the plants, on which depends the ecological optimum, are the climate (air and water regime) and soil composition. Geographic and orographic factors influence indirectly the agro ecosystems by varying climatic and edaphic factors.

Keywords: gardening, climatic factors, vegetable, air, water, soil, greenhouses

1. INTRODUCTION

Requirements of vegetable plants towards environmental factors were formed slowly, during the phylogenesis of the species, and for the moment are well consolidated. In crop, as the environmental conditions are provided closest to the phylogenetic formed plants, the growing and developing plants, and therefore the productivity will be high.

However should not lose in mind that growth factors act complex, being in constant interdependence. This enables the compensation or their conjugation to increase efficiency in achieving optimum productivity. For example, it is known that in conditions of irrigation the plants consume more nutrients, and as a result, increasing the amount of ground water makes necessary to increase doses of fertilizer and a suitable working the soil [1].

2. THE IMPORTANCE OF WATER FOR VEGETABLE PLANTS

The normal physiological and biochemical processes, essentially in growing and developing of plants can take place only in the presence of a certain quantity of water. Water is important in the photosynthesis process because it influences the quantity and quality of vegetables. The importance of water results from the fact that, generally speaking, the content of water in many vegetable species is high, reaching up to 80-95% of their total weight.

The water in the soil and plant has a special role in the development of oxidation processes and is included in the composition of many inorganic and organic substances.

In vegetable growing practice it interest the plants water demands, which consist in requirements and needs, requirements representing the amount of water that must be present in the soil for the plants to satisfy their needs. The effects of excess or deficit and how it can provide and maintain adequate moisture regime is also very important to know [2].

Depending on the biological specific of vegetables, the plants are grouped into:

- very pretentious: spinach, lettuce, cabbages, celery, leeks,
- pretentious: cucumbers, tomatoes, peppers, aubergines, okra, potatoes, beans, peas
- moderately pretentious: perennial species
- less demanding: watermelons and melons, pumpkins, squash

Depending on atmospheric humidity they have the following requirements:

- very high (85...95%): cucumber, celery, spinach, lettuce, mushrooms;

- relatively high (70...80%): cabbage, beets, carrots, parsnips, parsley, potatoes, peas.
- relatively moderate (55...65%): tomatoes, peppers, aubergines, beans.
- relatively low (45...55%) and yellow watermelons, pumpkins.

The plants demands must be satisfied by species, variety and culture system, taking measures to ensure the necessary, but avoid deficiency and excess.

During the growing season the vegetables plants have not the same requirements for moisture content (Table 1).

Table 1: Humidity requirements of vegetable plants, depending on the period and phase of growth (after Stan N. 1992)

Period	Faze	Humidity requirements
Seed	embryonic stage	At the beginning of phase moderately and afterwards high. Towards the end of phase moderate and afterwards reduced.
	repose	Reduced
	germination	high
vegetative growth	seedling	Moderate
generative growth	Flowering bud formation	high
	flowering	Moderate
	fructification	High at the beginning and moderate at maturity

3. THE IMPORTANCE OF AIR FOR VEGETABLE PLANTS

Among the vegetation factors that determines growing and developing of vegetables plants, a great importance has the air. Along with the other factors of vegetation, air and gas regime exerts a great influence on vegetable plants. They need to have a favorable treatment of air and gas as in the atmosphere above the ground, where they grow and develop aerial organs of the plants as well as in the soil, where the root system is located.

Atmospheric air composition is: 78% N, 21% O, 0.03% CO₂ and some other gases. It concerns from the vegetable point of view, the "CO₂" for photosynthesis and "O" for breathing. The oxygen in the atmosphere is sufficient, and in the greenhouses, any deficiency is corrected through vents. In soil, the oxygen sustains microorganism's life and their activity. Deficiency may occur on heavy soils, compacted, with excessive moisture, that can be corrected by removing the causes that produced it.

The atmospheric carbon dioxide maintains and favors the accumulation through "photosynthesis", which takes place normally at a concentration of 0.03%. Increasing the concentration to 0.2...0.6% can occur in conditions of high light intensity and maximum temperature values required by the plant, causing intensification of accumulation through photosynthesis. Adjusting the CO₂ content in protected areas can be done through vents and the supplementation of the quantity with special facilities. Increasing the amount of CO₂ in the ground must be avoided because it blocks the metabolic processes. Maintaining a constant amount of CO₂ is done through special works or loosening of the soil, avoiding excessive moisture content.

In greenhouses heated with the biologically substrate, the ammonia is released, that at a concentration of 0.1% is harmful to plants and in proportion of 3...4% is noxious. At greenhouse crops is not recommended to use as fertilizers the fresh manure because it's the decomposition liberates ammonia. Also in protected crops may appear sulfur dioxide that is harmful to plants even at low concentrations of from 0.001 to 0.002%.

The main source of air pollution is formed by combustion products such as: oxides of sulfur, nitrogen oxides, carbon monoxide, gaseous hydrocarbons and solids, powders resulting from various combustion. The atmosphere is also contaminated by natural products such as volcanic ash, plant pollen, dust, high winds and storms. Since the specific problems of crop production require location near major cities, the air pollution causes significant damage to vegetable crops. The effects of air pollution on vegetable plants are even higher due to multiple agents that usually acts synergistic. In Table 2 we can see the sensitivity the some vegetable plants towards air pollutants [3].

Table 2: The degree of sensitivity of vegetables plant towards some air pollutants (after Ionescu Al., 1982)

The pollutant	The level of sensitivity		
	Resistant	Medium resistant	Sensitive
Sulphur dioxide (SO_2)	cucumbers, melons	onion, garlic, leek, celery, cabbage, peas, spinach, beets, tomatoes	peppers, beans, chicory, artichokes, sorrel, carrots, radishes, lettuce, aubergines,
Fluorine and its compounds	cabbage, carrots, lettuce, pumpkin, asparagus	beans, peas	onions, garlic
PAN (nitrile peroxy-acetate)	cabbage, zucchini, radishes, onions, cucumbers	carrot	peppers, chicory, beans, lettuce, spinach, beets, tomatoes, celery
Chlorine and its compounds	peppers, aubergines	cucumbers, zucchini, beans, tomatoes	onions, radishes
Ozone (O_3)	cucumbers, lettuce, beetroot	chicory, carrots, parsley, parsnips	beans, onions, zucchini, radishes, spinach, tomatoes

4. IMPORTANCE OF SOIL AND NUTRITION FOR VEGETABLES PLANTS

Soil is the main means of production, and the quantity and quality of production depends on soil fertility and its use. For vegetables plants are indicated medium soils, clay loam, loam and sandy loam.

In the case of cultivating the plants in protected area through enhancement and improvement measures by using large amounts of organic fertilizers, are produced fundamental changes in characteristics of the soil zone, in which case are uses the notion of culture substrate [4]. For the vegetable growing practice presents importance the following characteristics: texture, structure, reaction (pH) and buffering capacity.

Nutrition represents plant nutrients that must be provided for the purposes of metabolic processes, which can be found in soil composition or administered by fertilization. Plant demands towards nutrients consist in requirements and needs, which vary with the biological specific, period and duration of vegetation, the productive potential of species and plants. Nutrients are used by vegetables plants in different proportions, but each of them plays an important role in metabolic processes. The role of the macro N, P, K, Ca, Mg, S occur on the general level and the micro elements B, Cu, Mn, Mo, Zn, Fe, Al, in a more restricted way, but none of them cannot miss in the complex nutrient, but neither should be in excess, in both cases causing unwanted changes.

Providing plant nutrients is performed by administrating fertilizers, which can be grouped according to their nature in: organic, organic-green, simple chemical or complex organic-mineral, bacterial. How, when and form of administration are established mainly according to plants demands and crop system, and the amount is determined by calculation [5]. For the adequate supply of vegetable plants is absolutely necessary the presence of nutrients that are in the soil under the form of compounds, and in terms of practical interest the degree of solubilisation and dissociation of elements as cations and anions, form in which are absorbed by the plant (Table 3).

Table 3: The limit content for mineral nutrition elements of soil for vegetables plan species (as M. Balasa, 1973)

The degree of soil supply	Elements of soil mineral nutrition (mg / 100g soil)					
	N total	P ₂ O ₅ assimilable	K ₂ O assimilable	Mg assimilable	Fe p.p.m	Mn p.p.m
Poorly supplied	under 10	under 20	under 17	5 - 9	0,8 - 1	2 - 3
Average supplied	10 - 20	20 - 26	18 - 30	10 - 15	1 - 1,2	3 - 4
Well supplied	20-30 and over	over 27	31 - 42 or over	15 - 20	over 1,2	over 4

5. CONCLUSION

1. Knowing the vegetable plants requirements has a practical importance because it is the basis of establishment and conveyance of culture technology.
2. The importance of water results from the fact that, generally speaking, the content of water in many vegetable species is high, reaching up to 80...95% of their total weight.
3. The water in the soil and plant has a special role in the development of oxidation processes and is included in the composition of many inorganic and organic substances.
4. In vegetable growing practice it interest the plants water demands, which consist in requirements and needs, requirements representing the amount of water that must be present in the soil for the plants to satisfy their needs.
5. It concerns from the vegetable point of view, the "CO₂" for photosynthesis and "O" for breathing.
6. Soil is the main means of production, and the quantity and quality of production depends on soil fertility and its use.
7. Nutrition represents plant nutrients that must be provided for the purposes of metabolic processes, which can be found in soil composition or administered by fertilization.

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