RANUNCULUS CROP MANAGEMENT

PREPARATION OF THE CROP

Pedo-climatic factors

SOIL

At the beginning of the cultivation of the buttercup is better to gather some information relating to the type of soil and its physico-chemical characteristics. Although it grows well in various types of soil, new soils are preferred, but not too heavy, well-drained soils, with average organic matter and in good structure, homogeneous around the bulb so that the risk of its dehydration is reduced.

Disinfection of the soil

To ensure a healthy crop, free of pathogens (nematodes, soil insects, fungi) and free from annual / perennial weeds it is important to effect, 25-30 days before planting, the soil disinfection. This practice is essential, particularly in case of monoculture because of the higher the risk of "tired soil ". The techniques that can be adopted, in order of preference are:

Phisical media

Steam sterilization: the technique uses wet steam, superheated to 90 ° - 110 °C or a mixture of steam and air at lower temperatures (60 °-70 °C). Both methods are suitable for sterilizing limited volumes of soil as pallets, tunnels and greenhouses, but are too expensive and technically unfeasible for large areas and places with difficult access. It is important to note that in a so treated medium it can create a biological vacuum (rapid resettlement of the phytopathogenic flora in absence of antagonistic microflora) and the accumulation of ammonia derived from the fast

degradation of organic compounds; because of the risk of these bio-chemical alterations it is advisable to postpone the next planting at least 3 weeks. Solarization: a physical system, eco-friendly. Allows the heating of the first layer of soil (25-30 cm) up to temperatures of 45 °-55 °C by using only the energy from the sun during the summer months in which the radiation is stronger. To amplify the effect of heating, the soil is wetted and covered with transparent plastic sheets: the result obtained is enhanced if conducted in greenhouses or tunnels. This technique is environmentally useful because it doesn't harm too strong the microbial flora of the soil and has less drastic effects on abiotic components, however, it is subject to weather conditions and it influences crop turn-over for the unavailability of land for about a month.

Chemical Means: Fumigants, from Isothiocyanate of methyle (Dazomet and Methamsodio); Chloropicrine, single or in mixture with 1,3 Dichloropropene: these active principles have the advantage of being able to be distributed in aqueous suspension through the irrigation system on the surface of the soil (drip fumigation). To maintain the effectiveness of the treatment also in small doses, virtually impermeable film (VIF) can be used as an alternative to the normal polyethylene film. These are constituted by a polyethylene film coextruded with polyamide and ethyl-vinyl-alcohol, which allows maintaining at soil level a higher concentration of gas, and then exercise a higher biocide power.

Water

Water is the main constituent of the plant (on average 85-90% of SS) and the vehicle of nutrients absorbed by the roots that enable the plant to live, develop and

produce. It 'obvious that its chemical-physical characteristics may affect the expected production from the farmer. The parameters considered for water are:

Temperature;

pH - index that expresses the degree of acidity or alkalinity of a solution;

Salinity - expresses the total quantity of salts dissolved in water (TDS) and is measured through the determination of its electrical conductivity (EC). The capability of water to conduct electric current is directly proportional to concentration of dissolved salts. Since different units of measurement are used by analysis laboratories to express its value, here below is a converting table:

LETTURA	conducibilita' elettrica	mmho/cm	milliSiemens/cm	microSiemens/cm	TDS
	1 EC	1 mmho/cm	1mS/cm	1000µS/cm	640 ppm

This gives an idea of the quality of the water and its possible field of use:

Conducibilità elettrica µS/cm	Qualità dell'acqua
0-250	Molto buona,adatta a tutte le colture
250-750	Buona, tollerata da tutte le specie
750-2000	Mediocre,solo per colture tolleranti
oltre 2000	Inadatta alla coltivazione

The buttercup is a species with a medium tolerance to salinity. A salt stress due to the use of water of poor quality and / or fertilizing incorrect data, determine a considerable reduction of the leaf development (the reduction of SS is manifested as a lower number of flowers produced and shorter stems) with altered contents of Nitrogen (N), calcium (Ca) and potassium (K), as well as visible damage to the roots. Below is an example of analysis of water supplied by a laboratory:

pH	EC (µS/cm)	Nutrienti			
		Ioni		ppm (mg/l)	mM
7.2	510	Nitrato	NO_3^-	1.3	0.02
		Fosfato	$H_2PO_4^-$	0.0	0.00
		Solfato	SO_4^{--}	146.0	1.52
		Bi-carbonato	HCO_3^-	156.0	2.55
		Ammonio	NH_4^+	0.0	0.00
		Potassio	K^+	0.5	0.01
		Calcio	Ca^{++}	82.1	2.05
		Magnesio	Mg^{++}	11.7	0.48
		Sodio	Na^+	3.6	0.16
		Cloruro	Cl^-	10.6	0.3

Light intensity

Light is an indispensable condition for the process of photosynthesis. If light intensity is too high, it could inhibit a good vegetative development since photochemical oxidation reactions in leaves consume O2 and remove CO2. Each plant species therefore requires a specific and optimal value of radiation: in the case of Buttercup is in a range between 40,000 and 60,000 lux. In the early plantations, which often coincide with the warmer months, it is advised the use of shading which allows a reduction in the heating of the soiland protects tender vegetation. In greenhouses, the installation of internal thermal screens provides daytime shading and in winter nights a insulating action. The fundamental requirement for any type of growing structure should not be a barrier to air circulation inthe cultivation. In periods of low natural radiation and in countries where the number of daylight hours is naturally low, you can intervene, with cost effectiveness, with an additional source of artificial light to obtain at plants level an intensity equal to 3000 - 4000 lux; this may allow to obtain a possible advanced and increased flowering.

GROWING MANAGEMENT

The plantation

The cultivation can be carried out in the open air, under plastic or nets in white nylon, as well as in tunnels or in greenhouses according to climatic conditions of the area. The planting must be preceded by copious irrigation of the soil which is brought to its field capacity. This also allows a useful soil cooling to prevent burns on roots and rhizomes. The planting in raised flower beds facilitates irrigation and preserves the good health of the crop, and it must take place in the cool hours of the day by operating in such a way that the rhizomes are planted 0.5 to 1 cm deep. Advised density is 8-10 plants per square meter for the corm sizes 4/5 and 5/7. We prefer two rows on 60 cm wide beds, with 40 cm spaced rows. The distance between the bulbs will be 25 cm. on the row. For the 3/4 and 2/3 size corms a density of 13-15 bulbs per square meter is recommended, always in two rows, with bulbs distance of 14-16 cm on the row. Corridors of 40 cm.

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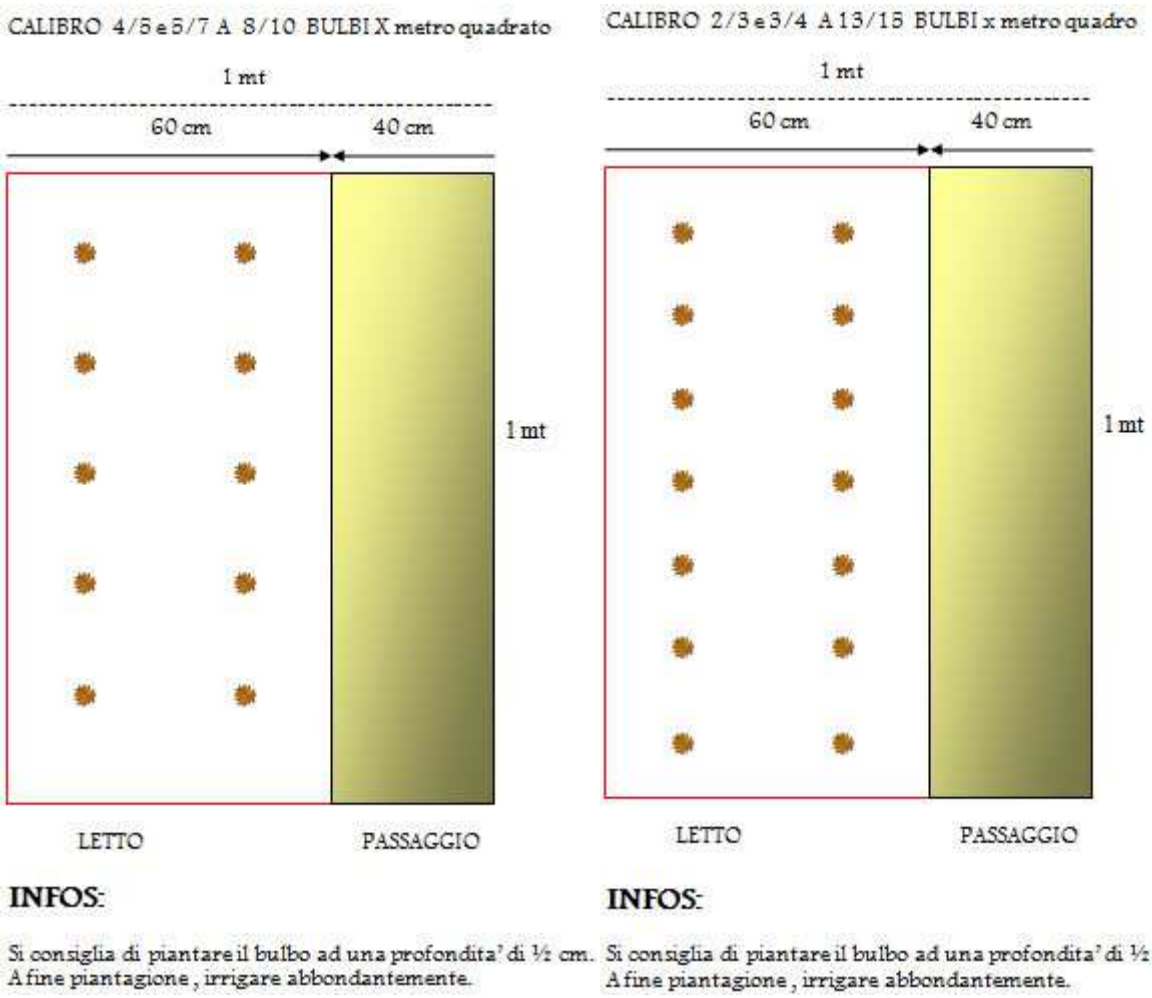

Remember that the main problem is the soil temperature at the time the plantation. High temperatures result in: - rotting of the bulb, delay in sprouting and late flowering - the development of many parasites and diseases. It istherefore recommend the following: - shade the soil at least 10 days before planting with black shadenets or with lime or shading products on the roofs of the greenhouses - moisten the soil with frequent wetting and not abundant before planting - cover the soil with mulching immediately after planting – after planting the first irrigation must be abundant, 20 liters of water per square meter, then continue with frequent lighter irrigations.

Irrigation and fertilization

The water balance of the plant is the difference between the amount absorbed by the the roots and the one dispersed with the drainage and through the transpiration, and it is subjected to regular oscillations which can be short or strong and prolonged. The purpose of irrigation will therefore be to keep in balance this parameter. The frequency and quantity of the amounts of water are largely dependent on soil and climatic conditions: irrigation must be frequent with relatively large amounts of water. The deep knowledge of these parameters is critical to the success of cultivation. In the early stages of the crop is good to intervene only with water so that the bulbs (dry) can be hydrated and may thus stimulate the development of young roots. Only later it is advisable to begin using water-soluble fertilizers, distributed in solution at a concentration of 1 ‰ (1 g / l of water). For a balanced action it is advisable to proceed only after having carried out an analysis of soil and of the irrigation water, that is essential in the case of hydroponics, and the information regarding the contents of anions, cations and trace elements will allow to draw up a suitable fertilization plan. Numerous studies have highlighted the importance of the genetic background on the behavior of the plant in response to the substrate on which it develops. It is obvious that it is impossible to make a nutrient solution for each variety but we need a satisfactory compromise. Thus the objective of a well balanced fertilization is to exploit the potential of every variety so that we can improve the quality of production. Below is shown a possible plan of fertilization:

Ranuncolo

• prime fasi di crescita	1: 0.5 : 0.5	+ microelementi
• periodo pre-fioritura	1: 1 : 1	+ microelementi
• fioritura	1: 1 : 1,5	+ microelementi

The leaf analysis conducted on plants in the buttercup are showing the role of some elements in the overall context of nutrition providing the following indications: From the beginning of planting, potassium (K) and calcium (Ca) are highly absorbed macroelements, then immediately afterwards, when the growth starts consistently, also nitrogen (N) is of course fundamental. The calcium (Ca) is important because it encourages the robust growth of tissues, protecting the plant from possible alterations (eg Botritis), nevertheless it is antagonistic to phosphorus (P), and its deficiency leads to fragile stems, thin, and deformed. Magnesium (Mg) is essential for the formation of chlorophyll, also facilitates the transport of the phosphorus (P) and its absorption, its deficiency shows yellowing of older leaves, in soil drought and limestone for antagonism with calcium (Ca). Yellowing to necrosis is also causes from iron deficiency (Fe) detectable especially in soils with stagnant water with pH> 7, with excess phosphorus (P), nitrate and when using water rich in bicarbonate. Boron (B), is a regulator of meristematic growth, it regulates the root development, the flowering and the transport of calcium (Ca) towards the apex: its deficiency leads to deformation of buds (bent neck in buttercups). The chelated form ensures systemic spread of the element and allows a high continuity in the circulating solution so avoiding phytotoxic accumulation. The excess of calcium (Ca) and magnesium (Mg) limit the absorption of potassium (K) while unbalanced fertilizations toward the nitrogen (N) lead to a deficiency visible by yellowing of

the leaf margin. The excess of phosphorus (P) if accompanied to that of potassium (K) leads to the formation of split flowers and stems (the phenomenon of the 'big head').

HARVEST AND PRESERVATION OF FLOWERS

Harvest is recommended in low light intensity, however, it is also possible in the course of the day. The flowers are stored in 2℃ cold store for a maximum of 2-3 days in containers with water. For a longer period of storing, the flowers should be kept in the container and just 1 cm of water. To prevent bacterial growth due to poor hygiene, it is recommended the use of post harvest preservatives for the rehydration and storage of flowers. These solutions include substances capable of suppressing bacterial growth and allow a better water suction by the stems, and therefore the extension of life to the lymphatic vessels avoiding the premature wilting of flowers. Best flower quality consists of straight stems, strong, well-dressed at the top with few leaves and shorter side stems at the base. The packaging is usually by bunches of ten flowers each, heads at the same level, in groups of five bunches each with plastic sleeve (with micro holes). Usually they have to be cold stored erected at a temperature of 2 ° C. The expected vase life is about 12-15 days.