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Impact of water deficit on growth and yield of potatoes

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ABSTRACT

Potato is considered one of the essential vegetable bounties in the boffin due to its high fed value among those crops, including Iraq, as there are some countries in the world where potatoes are the main food for those peoples, so there are continuous and important studies to find out the extent to which potato plants need irrigation water and the critical periods for plant growth With the best amount of irrigation water, as the water mainly affects the yield of the plant within the unit area through its influence on the characteristics of vegetative growth represented by the number of leaves, the leafy area of the plant and the number of branches of the plant, which is reflected in the yield of the plant as the water represents 90% of the weight of the plant, through which Nutrients are transported to different parts of the plant and this is what all studies have reported.

1. Introduction

Potato (Solanum tuberosum L.) vegan bounty belonging the Solanaceae family. It occupies a good place among the vegetable crops, especially the tuber (Hassan, 1999), and strategically comes fourth after wheat, corn and rice (Bowen et al. 2003). Potatoes are vegetables that are sensitive to ground moisture, as drought, excess moisture, or irregularity cause significant damage to plants. Light irrigation at frequent intervals is better than heavy irrigation at intervals, and it is always preferable to irrigate potato fields whenever the moisture in the upper fifteen centimeters of the soil reaches 50% of the field capacity. Waiting until it reaches 25% of the moisture at the field capacity has its negative aspects on growth, yield, and quality characteristics, and the potato plant needs ground moisture during the stage of formation of runners (ground stems) and the beginning of tuber formation.

Potatoes cannot bear the increase in ground humidity immediately after planting the seeds, especially when the temperature is high, because this leads to rotting of the seeds. The ability of the seeds to withstand soil saturation with moisture increases with the decrease in temperature. In addition to the foregoing, the increase in ground humidity during the growth and formation of tubers leads to a decrease in the specific density of the tubers, and the appearance of a clear, undesirable white tissue at the site of the lenticels. Therefore, very vital lout irrigation at the finale of the germination course, unless the purpose is to reduce the soil temperature. in hot weather. Potatoes are plants that consume large quantities of water, except for the germination period.

The irregularity of ground humidity at the time of tuber formation causes many deformities in it. This is due to the fact that the growth of tubers decreases significantly in periods when the ground humidity decreases, and its cells begin to mature. If the ground humidity rises suddenly, growth cracks form as a result of the inability of the outer cells Which began to mature to grow to accommodate the increase in the size of the tuber as a result of the rapid growth of internal tissue cells that are suddenly activated with the rise in ground humidity, as well as the drying of the soil with the rise in temperature sometimes leads to breaking the dormancy of the new tubers formed, so they begin to plant in the soil, If the ground humidity suddenly rises, these tubers give undesirable secondary growth.

Sources Review

Studies have shown that water is necessary for the growth of potatoes and giving an ideal yield of marketable tubers. (Nahar, et al. 2011; Alaa et al. 2012) water essential element for plant life, lack of water affects mainly on the growth, development and

yield of crops (Bhardwaj and Yadav, 2012). Studies showed that there is an effect of irrigation levels on the characteristics of vegetative growth and yield in potatoes. In the same way, Aksic et al. (2012) recommended that the market yield of potatoes increased with increasing irrigation water. Moreover, Abdrabbo et al. (2007) and Mohamed et al. (2018) indicate that the highest yield of potato tubers obtained at an irrigation level of 1.00 (ET).

As for the effect of irrigation water on potato tuber quality, Karafylilidis et al. (1996) indicated that high soil moisture levels produced tubers big sizes while small potato most repeated in watery -deficient. same results were observed with potato plants (Mahmoud et al., 2019). Furthermore, Mutava et al. (2015) and Mohawesh (2016) noted that stopping the irrigation water make to significant declining in the proportion of photosynthesis in the leaves of soybean and eggplant compared to the full irrigation treatment. In addition, Mahmoud et al. (2019) noted that the highest values of carbohydrates, starch and mineral elements (N, P and K) in potato tubers and the supreme worths of potato agriculture accretion, bounty and qualitative of tubers were obtained with irrigation periods every three days compared to four days and two days. The potato plant needs 105 liters of watery to generating 1 kg of potatoes (Renault & Wallender, 2000) compared to other plant

Knox et al. (1997) indicated that potatoes had need irrigation watery ranging from 143 mm to 313 mm, while Li et al. (2022) & Vishnoi et al. (2012) indicate that potatoes require 126-381 mm and 212-226 mm, respectively. Most potato cultivars have Shallow root system (Van Loon, 1981), which makes it difficult for them to suck watery from visceral clod classes in the event lack of water. root hoving is positively related by tubercle got below curtness terms (Lahlou and Ledent, 2005). Aliche et al. (2018) explained that the transpiration process differs between potato cultivars according to shoot size and leaf nature.

Pinheiro and Chaves, (2011) note that curtness affects plant accretion in several forms reckon on the time, severity of drought, & stage plant development. Drought causes the stomata to close, increasing the concentration of sugar in the leaves and thus closing the stomata under the pressure of drought, which helps the plant to maintain water inside the leaves, but it also reduces the carbon dioxide absorbed by the plant, which affects the photosynthesis process (Chaves, Muthoni 2002). and Kabira, 2016). Increasing the concentration of sugar in leaf tissues manuals to letting of photosynthesis, which impact plant development and bounty (Basu et al., 1999). Moreover, it may cause hypoxia within plant cells, which had cause cellule spilling true to severe damage (Finkel and Holbrook, 2000). However, all of these result in a decline in accretion as plant peaking, number of leaf first visible signs of water stress (Deblonde and Ledent, 2001).

tuber size is strongly impact by water deficit (Carli et al., 2014, and Obidiegwu et al., 2015). In another study by Boguszewska-Mankowska et al., (2020) they showed that the impact of Water need on potatoes scaling, that the potatoes scaling of all varieties low beneath deficit dryness above 1248 g (Guayzada) - 788 g (Jiken). It is clear from these studies that the decrease in the water content in the tuber causes a decrease in the yield of fresh tubers. which have shorter growth periods, as early ripening varieties, under drought pressure, delay tuber formation, which leads to a decrease in tuber weight. fresh.

Conversely, late ripening cultivars showed delayed tuber formation, enlarged tubers, and had time to recover from drought stress which aided increasing new potatoes hefting production (Chang et al., 2018). Similar results were obtained from other studies (Curwen, 1993, Salehi-Lisar, Bakhshayeshan-Agdam, 2016, Al Mahmud et al., 2015). Fresh tuber weight, curtness impact the number of potatoes plants (Eiasu et al., 2007). The kits of tubercles by plants depends on the scheduling and term of curtness plying.this lead to low tuber kits in all sort (Aliche et al., 2018). Similarly, primary strains has been shown to have an inhibitory effect on the number of tubers produced by plant (Haverkort et al., 1990); also overdue strains showed loud getting tubercle moistureless mass than on tubercle kits (Muthoni and Shimelis, 2020).

Also, some papers have indicate topping up in the kits of tubercles below curtness strains (Rykaczewska, 2017 and Lahlou et al., 2003) this could be to the acclimation reacting of sorts to stetting crops below curtness strains (Aliche et al., 2018) or the effect of the existing abiotic stress. Indeed, as reported by Rykaczewska, (2017), there is an increase in tubers of small size the kits of big tubercles decline under drought pressure compare with small tubercles.Shoot promoting is one of the more curtness-finical gests in plants. Shao et al. (2009). were reported by Chang et al., (2018) (Aliche et al., 2018) in potatoes. It is believed that vegetative growth is reflected by a higher turgor pressure which aids in cell expansion and thus growth (Kesiime et al., 2016).

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