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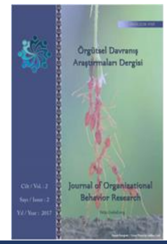

Studying the Biological Performance of Soybean Plant in Different Conditions

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ABSTRACT

This study aims to investigate the biological performance of soybean in various settings. The descriptive-analytical research approach was used, as well as library resources. Soybean has been demonstrated to be very sensitive to photoperiodism in studies, and this is a key factor in its breeding selection. The second most critical aspect is temperature, which should be kept between 30-33 degrees Fahrenheit every day for most cultivars. However, before flowering, it does not appear to be very sensitive to daily temperatures. Temperatures of 20 °C or less each day postpone flowering and, when combined with overcast days, extend the developing stage and diminish seed output dramatically. To obtain good yields, a rainfall of roughly 700-500 mm is required. However, soybeans can endure dry soil conditions before blooming. From the blossoming stage through the final stage of pod filling, however, enough moisture is required. Waterlogging affects yield at every stage of soybean development, although mature soybeans are more resistant to waterlogging than maize or peanuts, especially at the germination and garlic stage.

Keywords: *Soybean plant, Seed reaction, Seed weight, Soybean flowering stage*

INTRODUCTION

Soybean is one of the most important crops, and its importance is expected to grow over time because this plant, in addition to having a high to a high content of oil in the range of 18 to 2) percent and a rich source of protein in the range of 3732, which is less important than its oil, has a high to a high content of protein in the range of 3732. However, experts believe that as the world's population grows and there is a greater need for low-cost protein sources, soybean meal's relevance will grow, and more diversified products will be produced from it (1). Soybean is one of the most significant agricultural goods on worldwide markets. For grain, meal, and soybean oil, there are three primary markets. The oil has been edible for it, and it is sold in a variety of forms, including margarine and solid oil, and it competes with other vegetable oils in this regard (2).

It has a larger concentration of important fatty acids than other vegetable oils, which are 10% saturated, 92 percent polyunsaturated, and 13 percent unsaturated, and this is owing to the abundant storage of fatty acids, particularly linolenic acid, which ranks first among stable oils (3). Soybean meal is in high demand as a protein source for use in cattle and taboo feeds. Although soybeans are transformed into a variety of different chemicals for human use, the amount is tiny and has little impact on soybean pricing. The need for oil and meal drives global soybean prices. Soybean meal is a protein source used in livestock and poultry feed. The average soybean meal output is around 79 percent of total soybean yield, with a protein level of around 50 percent. Soybeans, like oilseeds, had an increase in consumption from 1977 to 1989, but only in 1978; the 1980s and 1990s saw a drop in production due to severe changes in production levels and pricing. Soybean consumption climbed by 35% over these years, from 77 million tons at the start of these years to 10 million tons in 1987. Soybeans' percentage of worldwide oilseed consumption ranged from 8% and 52% throughout the same time period. In addition, because soybeans account for such a large proportion of worldwide oilseed consumption, variations in demand for this crop throughout time have influenced the demand trend for other grains around the world.

Theoretical foundations

Soybeans were initially introduced into Iran around 1310 through the Karaj Faculty of Agriculture, but soybean production as oilseeds began about 1392 in locations like Mazandaran, and soybean cultivation by oilseeds enterprises grew prevalent in other parts of the nation. Soybean agriculture in Iran has expanded in recent years, both in terms of area under cultivation and yield per unit area. Soybeans are grown in the spring and summer, with the second crop (summer agriculture in Iran occurs after crops such as wheat and barley, lettuce, and beans, and hence does not require particular land). Lorestan, East Azerbaijan, and Dasht-e Moghan are the most prominent soybean-growing areas in Mazandaran (3).

This plant is classified as a weed since it belongs to the legume family. According to the iron provided to oilseeds, the condition of soybeans in Iran has been improving in terms of research in the field of agriculture, with 1920 hectares planted with oilseeds in the prospective lands of Mazandaran in 1982. Soybean farming accounted for 39926 hectares of this total, the biggest area under soybean cultivation in Iran. In comparison to prior years, the output was 117,000 tons, indicating a considerable rise in production (4).

Botanical features of soybeans

Soybean, often known as oil bean, is an annual plant belonging to the genus Cuminosa Leguminosae 10 and the rough papillionaceae family, suited to tropical and subtropical regions and farmed under rainfall circumstances. However, for dry and semi-arid places with higher water demands, a new inversion (such as Williams for sites like Karaj) has just been developed (1). It grows well in both formal and sandy soils but is susceptible to soil salinity and acidity, ranging from slightly acidic to slightly alkaline (5). There are over forty species and over 3,000 cultivars worldwide, and they are visible as interwoven bushes spread throughout Asia and Australia (6).

Root

According to new research, the soybean root system is not a straight, deep root but rather consists of the main root with horizontal roots that grow about 50 centimeters along the soil surface before going deep into the soil to about 180 centimeters. Root growth in the vegetative stage is faster than aerial plant prices. Root depth is twice the plant's height during blooming, and root growth continues until seed production, then ends before the seed reaches physiological maturity. There are four types of roots: 1- The primary root, 2- Secondary root that emerges from the primary root 4-5 days after the seedling leaves the soil, develops 4-5 cm below the root apex and continues to grow like the primary root. However, the secondary root's diameter is lower than the primary root's. 3- Third roots grow higher than secondary roots and expand the root structure of the soybean. 4. Capillary roots are formed on secondary and third roots as well. The Syrian root is a large, thick plant with nitrogen-fixing glands (7).

Stem

The growth of the soybean's aerial components begins with the axis' escape from the earth and finishes with the grain's advancement. The total height of the soybean bun is 124-90 cm, with 19-24 straps that are plainly visible 4-5 weeks after the patrol. Soybean stems are frequently hairy and branch off from lower, smaller stems. Shrubs that reach their greatest height during blooming and then grow very little after that release more seeds than plants that expand rapidly after flowering (7).

Leaves

The cotyledons merge at the bottom, the second band has single-leafed cross-lobes, and the third and fourth bands have alternating triangular-ovate leaves on a long petiole and hairy earrings on the stem and lateral branches (7).

Flower

The number of flower clusters on each plant is 120-80, and each flower cluster may have 2-35 flowers, with the first flower looking upwards and the fourth to eighth clauses pointing downwards. Each flower has five sepals and petals that cover the female and the flag, as well as ten flags, nine of which are joined to each other and cover the female and one that is unattached. Three weeks after seedlings emerge from the earth, flower-forming cells begin to develop (7). Even though the pollination procedure for each pod took place at different times, the stage of soybean flower creation and seed growth in all pods concludes within a week. Day and night are the most important stimuli for flower production; heat and heat are hereditary (7).

Fruit

Soybean fruit is a short, hairy pod with a length of 100 cm and a width of 4 cm, depending on the variety. The pods develop 10-14 days after blooming begins, with an average of 400 pods per plant and 300-250 seeds per plant, with 2-3 seeds or more in each pod (7).

Literature review

According to Air et al. (1980), retinal stress affects numerous physiological activities of soy, including photosynthesis, cell division and enlargement, and nutrient accumulation and transport (8). Water stress can lower yield at any stage of soybean reproductive development, according to Daneshian and Ghalebi (1999). However, the biggest drop occurred during grain filling and pod formation. Water stress had no influence on the number of seeds per pod; however, lowering the number of pods per plant resulted in a drop in the number of seeds per plant. In addition, there was no significant correlation between grain yield, number of seeds per plant and grain weight. Cox et al. (1986) also found that light and heavy watering treatments produced 20 percent and 77 percent fewer pods, respectively than controls. In moderate stress, the number of seeds in pods was the most important factor, but in severe stress, both variables lowered the number of seeds in soybeans (10). Das et al. (1974) experimented with not irrigating the field at various phases of soybean growth and found that the seed closure stage is the most vulnerable to crop loss due to non-irrigation (11). According to Meadl et al. (1984), the loss of pods and flowers caused a decrease in the number of pods in soybean nodes, and drought stress caused the abortion of pods and seeds by reducing photosynthetic material production and impairing material transfer, resulting in a decrease in the ratio of grain weight to so-and-so weight. As the stress level increases, grain weight also decreases dramatically. As a result, a dramatic fall in the number and weight of grain was the cause of the decrease in grain production at stress levels (12). Plants subjected to stress at stage R1 totally recovered following stress, according to Mo'men et al. (1979) (13). The daily water intake of soybeans changes based on numerous elements, including time to soil water level with radiant energy, temperature, and wind speed, according to Zionit et al. (1999) (14).

Most crops, according to Rahimian et al. (1996), go through many stages of development and water stress and display daily fluctuations in humidity in their internal water status, even when they are irrigated (15). According to Daneshian et al. (2002), stress during the pod formation stage lowers the number of pods and seeds, as well as their weight, in the stem's middle nodes (16). Although the loss of moisture was detrimental at all phases of growth, lack of water in the blooming stage, and pod formation, caused the fall of flowers and pods, and lack of water in the seed formation stage caused seed size reduction (17).

Daneshian et al. (2000) used stress during the RI stage (the start of flowering), i.e., when one of the main stem group's flowers is open. The plant tries to compensate for the drop in the number of seeds in the plant by maintaining 100 seeds in order to maintain grain production. Stress increases the fall of flowers and pods at stage R2 (the beginning of pod formation), i.e., when one of the four countable terminal nodes of the main stem bearing the pod reaches 5 mm, resulting in a decrease in the number of seeds in the plant (18). Schuler et al. (1998) discovered that at stage R4 (complete podding), there was a reduction in the number of seeds per pod and seed size. The main stem bearing the pod with a grain of 3 mm is at stage R5 (beginning of grain development), i.e., one of the four end nodes that may be counted. The seeds quickly fill up, and there is a great need for water. At this period, toxic stress and heat significantly diminish production, and pod filling is the most vulnerable phase for drought damage to the plant (19).

Stress in stage R6 (full grain size), i.e., one of the four countable terminal nodes of the main stem bearing pods whose pores are filled with green grains, affects yield by lowering seed size, according to DeLouch et al. (1980) (20). Moisture stress in soybeans is not as critical from plant establishment until blooming, according to Jahan et al. (2001). Dryness during aggregation lowers the number of soybean tubers, while dehydration during granulation reduces the number of pods per pod and grain weight, according to Shaw, Ling et al. (1999) experiments (21).

Bran et al. (1985) found that moisture stress reduced seed size and quantity in the R1 stage (full blooming) but not in the R2 stage (full flowering). The proportion of bloom and pod fall was unaffected by moisture stress (22). Egley et al. (1985) observed that the number of pods and seeds per unit area in the Japanese developmental stage was occasionally reduced due to competition between vegetative and reproductive organs and the loss of community photometer (23). According to Palmer et al. (1995), stage R1 is a crucial development stage in soybeans, similar to rejuvenation, and dryness can result in substantial output decreases (24).

Drought stress administered at stage R2 lowers the number of seeds in subsequent stages of reproductive development, according to May et al. (1992). Furthermore, when stress was applied to R2, the plant's dry weight was lowered compared to the control (25). According to McCall et al. (1984), severe stress lowered plant weight and yield by 20-50 percent and 21-46 percent, respectively, in the R-R phase. The decline in yield was attributable to a 16 to 15% reduction in the number of seeds per unit area (26).

In their study of the influence of potassium on photosynthetic activity and dry matter accumulation in plants, Marsher et al. (1995) discovered that the quantity of potassium affects the transport of photosynthetic material (27). Even minor soil K deficits impair netosterone transfer by decreasing photosynthesis, according to Jin Zinping et al. (1989) (24). Potassium consumption boosted zinc absorption and transport in maize, resulting in higher zinc concentrations in seeds and roots, according to Tendon (1992) (28). Given that the soybean plant requires a significant quantity of potassium, increasing potassium utilization will benefit the plant, according to Heriworth et al. (1984) (29).

According to Daneshian et al. (2000), when stress severity increased, the quantity and length of rootstocks reduced, and plant height dropped as a result. Plant height grew as the number of nodes increased with greater potassium treatment. The number of pods per plant and the number of seeds per pod declined as the severity of stress increased in the research of yield components, although the number of seeds per pod was the key factor in lowering the number of seeds in the average stress. Both variables lowered the number of seeds per plant when the plant was under extreme stress. With increased stress levels, grain weight also reduced dramatically. As a result, the drop in grain production was attributed to a significant reduction in the quantity and weight of grains (30).

In the application of 20 g/m^2 phosphorus and potassium solutions under soil moisture stress, Lopez et al. (1994) found no significant influence on yield, yield components, or harvest index (31). In a study of soybean drought stress, Ino et al. (1991) found that when soil water decreased, the potassium content of leaves increased fast in all sections of the stem, resulting in beta-water in the vessels being less than the water-water potential. The occurrence of stress resulted in a loss of dry weight in all regions of the plant. Finally, when stress increases, more weight accumulates in the plant's top portions (32).

According to Beaton and Sikhon (1985), wheat's potassium intake in water-stressed conditions is only 50 kg/ha, but it reaches 200 kg/ha under ideal growth conditions. Potassium flower harvest by four wheat cultivars is estimated to be 134 to 212 kg/ha, while potassium harvest per ton of wheat grain and straw is 10 to 20 kg, respectively (33). Kemler is a character in the film Kemler (1983). Inadequate daily potassium absorption during the early stages of wheat development is more detrimental than a lack after blooming. Potassium shortage affects the number of clusters in the 2-3 leaf stage and 1000-seed weight in subsequent stages (34).

Conclusion

The farmer's initial decision in soybean production should be to select the cultivar recommended by the relevant institutions. Government agricultural stations have spent a lot of time analyzing cultivars in various places, and it's likely that diverse tests will lead to the discovery of a particularly suitable cultivar for a particular region. However, the findings of these trials can identify which cultivars are unsuitable for a breed's deficiencies, and these cultivars can only be produced at a very low level for objective observations. Overall, the seeds should be healthy and good since, even if all of the growth circumstances are ideal, cultivating substandard seeds will not be successful and will result in poor performance. There must be no gaps in the seeds, and they must be free of weed seeds and other weeds.

The proportion of seed potency should be greater than or equal to 85 percent, preferably nearer to 95 percent. Experiments on how seeds react to low temperatures might give significant knowledge to northern locations with early crops. Seed size uniformity will substantially aid in efficient seed division and nurturing along the rows. Plants will be created by the cultivation of seeds of uniform size, resulting in uniform competition between neighboring plants and a reduction in competition loss.

The most reliable method of nurturing skill and quality is to use certified seeds. Because soybeans are a self-harvesting plant, the harvested seeds can be planted in subsequent years. However, in this case, the farmer must ensure that his seed is free of weed seeds and that the threshing machines uniformly distribute the seed size, and before planting, a test should be performed to determine the percentage of seed vigor so that the patrol rate in creating the desired plant density can be determined. The time of maturity in the culture medium is the first factor to consider when selecting a cultivar. The production of an earlier cultivar than the region's so-called cultivar has reduced, and the cultivation of a later cultivar is more likely to never reach maturity or produce low-quality seeds in tiny amounts.

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