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EFFECT OF VARIOUS SOWING DATES ON THE GROWTH, YIELD AND QUALITY OF SOYBEAN

Kaleri Ghulam Sajjad[1]*, Irfan Jat[2], Murad Ali Magsi[3], Danish Manzoor[3]
[1]Department of Plant Breeding and Genetics, Sindh Agriculture University Tandojam, PAKISTAN
[2]Department of Entomology, Sindh Agriculture University Tandojam, PAKISTAN
[3]Department of Agronomy, Sindh Agriculture University Tandojam, PAKISTAN
*Corresponding author: gskaleri22@gmail.com

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ABSTRACT

Soybean (Glycine max L.), known for its abundant protein and oil content, holds significant prospective to play a crucial role in addressing especially oil and protein demand of the planet. While talking about the production of Soybean, the sowing timing may also potentially influence its growth, yield, and quality of soybean crops. Hence, a study was carried out at Kaleri Agriculture Farm in Tando Jam, Sindh, involving the cultivation of Kharif-93 Soybean varieties on various sowing dates in 2019 (7th Feb, 17th Feb, 27th Feb, 9th March, and 19th March). The findings of the experiment in the study area revealed that the sowing date of 17th Feb yielded higher compared to other dates. The yield parameters for different sowing dates were subjected to a t-test, given that the initial two sowing dates led to complete plant mortality. The statistically analyzed data indicated that the 17th of February sowing date exhibited superior germination counts and yielded higher numbers for various parameters, including pods per plant (30.53), seeds per plant (80.50), plant height (96.10 cm), 1000-seed weight (74.70 g), seed yield (1535.3 kg h-1), biological yield (4434.1 kg h-1), protein content % (32.60), and oil content % (20.95). In contrast, late sowing dates did not perform accordingly. This can be attributed to the fact that delayed planting did not allow the crops to reach their optimal capacity due to unfavorable (temperature increase) environmental conditions for Soybean cultivation. Hence, the study recommends sowing date of Soybean mid-February in the study area/Tandojam (district Hyderabad).

Keywords: Sowing dates, Soybean crop, Sindh

INTRODUCTION

Pakistan imported 1.98 million tons of edible oil to meet the domestic demand against 2.045 million tons in 2016-17, that worths 152.514 billion US dollars, while local production only generated 14% of total demand. This is enough to show that the country's oilseed cultivation is not good. Due to population growth, especially in developing countries including Pakistan, the supply of edible oils, especially animal fats, is scarce and expensive (Amiri, et al., 2012). Soybean (Glycine max L. Merrill) is a rich source of protein and fat and plays an important role in this field. In Pakistan, improved soybeans were introduced to the United States in the early 1960s, and commercial planting began in the early 1970s. Since then, their cultivation in Pakistan has been unstable and has never reached excess production levels. The decline in soybean yields in Pakistan may be due to lack of information on production techniques, high temperatures, poor conditions, poor adaptability, and low sales (Yousaf, et al., 2018). Among them, sowing time is one of the most important factors affecting the productivity of soybean crops (Borowska & Prusiński, 2021). Sowing time has a major impact on seed germination (Andric et al., 2007), nutritional and reproductive characteristics (Bastidas et al., 2008) and grain yield (Egli & Cornelius, 2009). In addition, soil moisture is critical for high yield potential from seedlings to mature soybeans (Mengistu and Heatherly, 2006). The date of sowing usually determines the potential yield of a variety in the agro-ecological zone. Weather conditions such as temperature, humidity and day length can be optimally utilized by appropriate seeding dates (Hashemi, 2001). For each produce, choosing the right seeding date is critical to maximum productivity. The purpose of choosing the correct sowing date is to determine the correct time for all

environmental factors to be effective at different stages of the plant (Azari & Shahbazi, 2017). A study found that higher temperatures and radiation alter the reproductive stage under adverse conditions (Egli & Bruening, 2000). The high temperatures caused by delayed planting of soybeans cause the pods to breathe more; thereby reducing the accumulation of assimilates. As a result, seed yields decline, plant heights also decrease, oil content decreases, and seed yields decline (Whitfield, 1992). In the field, temperature changes significantly and affects plant growth. During the soybean growing season, when the temperature rises from the ideal temperature, it causes stress conditions and has a devastating effect on flowering, pod development, seed formation and complete maturity of the crop (Khan, et al., 2011). Qualitative parameters include protein and oil content in the seed, which is strongly influenced by genetic factors (such as the selection of mature varieties and populations during seed formation) and climatic factors (such as temperature and humidity) (Robinson et al., 2009). Changes in seed quality are primarily related to the effect of temperature on enzymes that affect fatty acid biosynthesis in soybean seeds, especially during seed development (Bachlava & Cardinal, 2009). After the discussion, the research plan evaluated Tando Jam approval of the potential and adaptability of soybean varieties and determined the impact of the date of sowing on growth, yield parameters and soybean quality.

MATERIALS AND METHODS

A field experiment to assess the effect of different sowing dates was laid out at Kaleri Agriculture Farm Tando Jam Sindh 2019 under three replicated randomized complete block design (RCBD) having plot size of 4x5 (20 m2). Seedbed was prepared and recommended land preparation practices were adopted for soybean. The most common local variety Kharif-93 was selected and included in this study. The experiment had three replications at maturity 15 plants were harvested from each experimental unit to measure Number of pods per Plants, Number of pods per Plants, Plants Height (cm), 1000-seed weight (g), Seed yield (kg h-1), Biological yield (Kg h-1), Protein percent % and Oil Percent %

Statistical analysis

The data underwent ANOVA analysis using the MSTAT-C statistical package, and the LSD test was employed to compare means for superiority wherever deemed necessary (Russel & Eisensmith, 1983).

RESULTS

The result showed significant ($P<0.05$) different sowing dates and positive impact on physiological, yield of soybean (Table-1) compared to the different sowing dates (T1=7th Feb, T2=17th Feb, T3=27th Feb, T4=9th March, and T5=19th March. The number of pods per plant in the maximum range was recorded 30.53 under treatment sowing date Jan 17th Feb and the minimum number of pods was observed 13 under treatment date 19th March.

Tables-1. Effect of various sowing dates on soybean growth parameters

Treatment Planting Time	Number of pods per Plants	Number Of Seeds per Plants	Plants Height (cm)	1000-seed weight (g)	Seed yield (kg h^{-1})	Biological yield (kg h^{-1})	Protein %	Oil %
T1=7th Feb	29. a	78. a	92.10 a	72.85 ab	1414.5 a	4310.0 ab	31.70 c	20.61ab
T2=17th Feb	30.53 a	80.50 a	96.10 a	74.70 a	1535.3 a	4434.1 a	32.60 b	20.95 a
T3=27th Feb	20.43 b	59.10 b	77.90 b	70.90 b	1189.5 b	4182.2 bc	32.50 ab	20.10 bc
T4=9th March	18.10 b	49.05 c	59.60 c	68.10 b	810.5 c	4090.7 cd	33.55 a	19.35 cd
T5=19th March	13. c	35.70 d	66.10 c	64.97 c	930.1 c	3947.6 d	33.29 a	18.90 d
LSD 0.05								

The data showing results number of seeds per plants 80.50 was recorded which plots grown in sowing 17th Feb and the maximum number of seed s per plants was observed 35.70 under sowing date 19th March. The plants height was significantly affected by different sowing times result showing 17 Feb sowing date produce significantly taller plants 96.10 cm then other sowing date treatments and minimum plants height was recorded 59.60 under sowing date treatment 9th March respectively. The different sowing date showed that maximum

1000 seed weight (g) 74.70 was recorded under treatment 17th Feb showing significantly affects and the minimum 1000 seed weight (g) 64.97 was observed under treatment sowing date 19th March. The seed yield kg ha-1 of soybean significantly affected by different sowing dates. The maximum seed yield kg ha-1 was recorded 1535.3 under sowing date 17th Feb and minimum seed yield kg ha-1 was observed 810.5 on the sowing date 9th March. The analysis of data showing that biological yield of soybean was significantly affected on different sowing dates. The maximum biological yield was recorded 44.34.1 under treatment sowing date 17th Feb and the minimum sowing date was observed under treatment 3947.6 under sowing date 19th March. Maximum protein percent (33.55%) was recorded under sowing date 17 Feb and minimum protein percent (31.70%) was measured under sowing date 7th Feb. The results showed that a maximum oil percent (20.95%) was recorded under sowing date 17 Feb and minimum oil percent (18.90%) was measured under sowing date 19th March.

DISCUSSION

Soybean has special importance in oil and protein percent worldwide. It produces rich sources of edible oil, protein, and animal feeds (Rajcan, et al., 2005). Our result showing highly significant we observed sowing dates also effect of soybean growth, oil percent, protein percent and yield this result also reported Yousaf, et al. (2018). In this study the number of pods per plant showing good results, sown early and mid of February, similarly, Ahmed, et al. (2010) reported. Late sowing date significantly affected soybean number of pods per plants compare our result with Lee, et al. (2019) shared. Number of seeds per plant significantly affected early and mid-sowing dates also reported Calvino, et al. (2003). Observed sowing dates also affected number of seeds per plant and compare our result same as Lee, et al. (2019). The late sowing date affected number of seeds per plants. The plants height was significantly affected by different sowing times in our study early date and mid date showing good result according to late sowing date compare with our data like same Muzammal, et al. (2014), who explicit that photoperiod sensitivity had marked reduction in growth amount because of delayed seeding would possibly account for decrease in plant height, different sowing date the 1000 seed weight (g) this may be short vegetative growth amount and long procreative and grain filling amount that considerably raised these result same like Pedersen and Lauer 2004. In the case of soybean, who expressed that average seed weight from early sowing was better than that from late sowing dates. Early planted varieties got longer and growth amount to accumulate additional photo-assimilates. Moreover, high temperature cause shrinking of seeds. The scientists conclude genotypes have a major effect on seed yield. Effects revealed that with the late sowing of spring soybean. Effects revealed that with the delayed planting of spring and coil soybean after January their yield lost drastically over time as it results in a reduction in vegetative and reproductive growth method. Late sowing date planting scheduled to the loss the good growth and development. Crop was not achieved the potential ability because light interception and crop simulate partitioning were severely affected and therefore lead to yield decline. With late planting the improvement period becomes short. Great temperature during flowering lowers the seed yield and yield components of soybeans and almost same results were shared by different studies (Calvino, et al., 2003; Ahmed, et al., 2010; and Yousaf, et al., 2018).

CONCLUSION & RECOMMENDATIONS

It is concluded that the Soybean yield and quality may be improved if cultivated during mid-February in district Hyderabad, therefore recommends the same to the local Soybean farmers.

REFERENCES

Ahmed, M.S., Alam, M.M. and Mirza, H., 2010. Growth of different soybean (Glycine max L. Merril) varieties as affected by sowing dates. *Middle East Journal of Scientific Research*, 5(5), pp.388-391.

Amiri, S.S., Ghasemi, M., Daneshian, J. and Azimi, J., 2012. Evaluation Of yield different soybean varieties in spring and Aestival cultivation. *Advances in Environmental Biology*, pp.526-530.

Andric, L., Teklic, T., Vrataric, M., Sudaric, A. and Duvnjak, V., 2007. Soybean seed vigour and field emergence under influence of cultivar, seed age and planting date. *Cereal Research Communications*, 35, pp.177-180.

Azari A. and Shahbazi, H., 2017. Effect of planting date and biological and chemical fertilizers on phenology and physiological indices of peanuts. *Iranian Journal of Field Crops Research*, 15(1), pp.216-230.

Bachlava, E. and Cardinal, A.J., 2009. Correlation between temperature and oleic acid seed content in three segregating soybean populations. *Crop Science*, 49(4), pp.1328-1335.

Bastidas, A.M., Setiyono, T.D., Dobermann, A., Cassman, K.G., Elmore, R.W., Graef, G.L. and Specht, J.E., 2008. Soybean sowing date: The vegetative, reproductive, and agronomic impacts. *Crop Science*, 48(2), pp.727-740.

Borowska, M. and Prusiński, J., 2021. Effect of soybean cultivars sowing dates on seed yield and its correlation with yield parameters. *Plant, Soil & Environment*, 67(6).

Calvino, P.A., Sadras, V.O. and Andrade, F.H., 2003. Development, growth and yield of late-sown soybean in the southern Pampas. *European Journal of Agronomy*, 19(2), pp.265-275.

Egli, D.B. and Bruening, W.P., 2000. Potential of early maturing soybean cultivars in late plantings. *Agronomy Journal*, 92(3), pp.532-537.

Egli, D.B. and Cornelius, P.L., 2009. A regional analysis of the response of soybean yield to planting date. *Agronomy Journal*, 101(2), pp.330-335.

Hashemi, J.M., 2001. Sowing date on the developmental stages and some agronomic and physiological characteristics of five soybean cultivars grown in the second planting. *Crop Sci. J*, 3(4), pp.49-59.

Khan, A.Z., Shah, P., Khan, H., Nigar, S., Perveen, S., Shah, M.K., Amanullah, S.K., Khalil, S.M. and Zubair, M., 2011. Seed quality and vigor of soybean cultivars as influenced by canopy temperature. *Pak. J. Bot*, 43(1), pp.6743-648.

Lee, J.E., Jung, G.H., Kim, S.K., Kim, M.T., Shin, S.H. and Jeon, W.T., 2019. Effects of growth period and cumulative temperature on flowering, ripening and yield of soybean by sowing times. *Korean Journal of Crop Science*, 64(4), pp.406-413.

Russel, D.F. and Eisensmith, S.P., 1983. MSTAT-C. Crop and Soil Science Department, Michigan State University, USA.

Rajcan, I., Hou, G. and Weir, A.D., 2005. Advances in breeding of seed-quality traits in soybean. *Journal of Crop Improvement*, 14(1-2), pp.145-174.

Robinson, A.P., Conley, S.P., Volenec, J.J. and Santini, J.B., 2009. Analysis of high yielding, early planted soybean in Indiana. *Agronomy Journal*, 101(1), pp.131-139.

Mengistu, A. and Heatherly, L.G., 2006. Planting date, irrigation, maturity group, year, and environment effects on Phomopsis longicolla, seed germination, and seed health rating of soybean in the early soybean production system of the mid-Southern USA. *Crop Protection*, 25(4), pp.310-317.

Muzammal, R., Tasneem, K., Ashfaq, A., Wajid, S.A., Fahd, R., Jamshad, H. and Saddam, H., 2014. Effect of planting time and cultivar on soybean performance in semi-arid Punjab, Pakistan. *Academia Journal of Agricultural Research*, 2(5), pp.134-138.

Whitfield, D.M., 1992. Effects of temperature and ageing on CO_2 exchange of pods of oilseed rape (Brassica napus). *Field Crops Research*, 28(4), pp.271-280.

Yousaf, S., Zohaib, A., Anjum, S.A., Tabassum, T., Abbas, T., Irshad, S., Javed, U. and Farooq, N., 2018. Effect of seed inoculation with plant growth promoting rhizobacteria on yield and quality of soybean. *Pak. J. Agric. Res*, 32, pp.177-184.