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# Effect of Sulphur and Sowing Date on Soil Fertility, Growth, and Yield of Rapeseeds (Brassica napus L.)

**Kushal Shrestha[1]*, Mr. Pravesh Rimal[2], Mrs. Melina Budha[3], Dr. Manoj Kumar Shukla[4]**

[1,2,3]Department of Agriculture, Uttaranchal (PG.) College of Bio-Medical Sciences & Hospital, Dehradun, Uttarakhand, India
[4]Assistant Professor, Department of Agriculture, Dev Bhoomi Uttarakhand University (DBUU), Dehradun, Uttarakhand.

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**Abstract:** Rapeseed (Brassica napus L.) is one of the most important oil seed crops globally, contributing significantly to edible oil production and animal fodder. The present study, conducted during the rabi season of 2022-23 at the Institute of Agriculture Training & Research, Prem Nagar, Dehradun, Uttarakhand, aimed to assess the impact of different sulfur doses and sowing dates on soil fertility, growth, and yield of rapeseed. The research evaluated key agronomic parameters, including plant height, number of leaves, seed yield, and soil nutrient status. Findings revealed that Sulphur application positively influenced crop performance, enhancing biomass production and oil content. Similarly, the optimal sowing date ensured maximum yield by mitigating temperature stress and synchronizing the reproductive phase with favorable climatic conditions. The study underscores the significance of Sulphur nutrition and appropriate sowing schedules in improving rapeseed productivity, thus contributing to sustainable agricultural practices.

**Keywords:** Dry Matter Accumulation, Growth Parameters, Plant Height, Factorial Randomized Block Design (FRBD), Yield attributes



# INTRODUCTION

India is a leading global producer of various agricultural commodities, ranking first in the production of spices, milk, and pulses, and holding significant positions in paddy, wheat, and cotton cultivation. The country benefits from diverse climatic conditions, encompassing 15 agro-climatic zones and 20 agro-ecological zones (Niwas et al., 2006). Among oilseed crops, rapeseed is the third most important oilseed globally, following palm oil and soybean, with major producers including India, Canada, China, and Nepal (Staff, 2019). Rapeseed (Brassica napus L.), commonly referred to as sarson, tori, or bird rape, belongs to the mustard family Brassicaceae and is valued for its edible oil, leafy vegetables, and use as animal feed. The crop is a significant component of India's agricultural economy, with its oil widely used in cooking, pickling, medicinal applications, and industrial processes such as leather tanning and grease production. Post-extraction, the residual oil cake is a nutrient-rich animal feed and organic fertilizer.

The plant of Rapeseeds grows up to 1 to 4 feet long with a many-branched stem, generally hairless and covered with a whitish film. Leaves are alternately arranged and also hairless, the lower leaves are up to 35 cm long, pinnately cut, with a large central lobe with one to four pairs of small side lobes, while upper leaves are slighter, non-lobed, have a pointed tip, clasping base and widened. Depending on climatic conditions, altitude, and mode of pollination the bright yellow flowers of *Brassica rapa* are clustered at stem tops with four petals in racemes at the end of branches, elongating in fruit to 40 cm long, two-parted capsules that opening at the base to release the seeds at the stage of seed maturity (Rahman et al. 2018 and USDA-ARS, 2018).

The growth and productivity of rapeseed are highly influenced by climatic conditions, soil type, and agronomic practices. The crop thrives in loam soils with a neutral pH and requires well-drained conditions for optimal growth. It is susceptible to water stress before flowering, necessitating careful water management. Additionally, temperature fluctuations, sowing time, and nutrient availability, particularly Sulphur, play a crucial role in determining yield and oil content. Sulfur is an essential nutrient for rapeseed, contributing to enzyme activation, protein synthesis, and oil formation. Both organic and inorganic Sulphur sources impact plant metabolism differently, with organic Sulphur improving soil health over time and inorganic Sulphur offering rapid nutrient availability (Baghdadi et al., 2018). Given the varying agroecological conditions across India, the requirement for sulfur application is location-specific.

Time of sowing is another critical factor influencing rapeseed yield. Delayed sowing exposes the crop to unfavorable weather conditions, reducing seed yield due to shorter silique filling periods and increased drought stress (Mendham and Salisbury, 1995). Important physiological attributes (i.e., growth and yield attributes) such as plant height, number of leaves per plant, seed yield and weight, foliage production, leaf area index, crop growth rate, and yield plot, are also affected by the date and time of sowing and can address various constraints of a variety for increasing its' productivity (Tandale and Ubale, 2007). Selecting an optimal sowing date can enhance growth parameters, including plant height, leaf area, and biomass accumulation, thereby improving overall productivity.

# OBJECTIVES

- To evaluate the effect of Sulphur application on rapeseed growth and yield.
- To assess the impact of different sowing dates on crop performance.
- To analyze the interaction between Sulphur levels and sowing dates on yield and soil fertility.
- To determine changes in soil nutrient status under varied Sulphur and sowing date treatments.

# MATERIALS AND METHODS

The present study, entitled "Effect of Sulphur and Sowing Dates on Soil Fertility, Growth, and Yield of Rapeseed (Brassica napus)," was conducted during the 2022-23 growing season at the experimental field of the Institute of Agriculture Training & Research, Prem Nagar, Dehradun, Uttarakhand, India. This section outlines the experimental site, climatic conditions, soil properties, field history, and experimental design.

**Experimental Site**: The experiment was carried out at the Institute of Agriculture Training & Research, Prem Nagar, Dehradun, Uttarakhand (248197), India, situated at 30.33° N latitude, 77.97° E longitude, and an altitude of 410 meters above sea level.

**Weather and Climatic Conditions:** The region experiences a sub-tropical climate, characterized by hot summers, cold winters, and monsoonal rainfall. The average annual rainfall is approximately 1200 mm, with about 80% occurring between mid-June and September. Meteorological data, including temperature, relative humidity, and rainfall, were recorded at the Meteorological Observatory in Selaqui, Dehradun, during the cropping season.

**Soil Properties:** The soil of the experimental field was sandy loam in texture. Composite soil samples were collected from a 30 cm depth before field preparation and analyzed for organic carbon, available nitrogen, phosphorus, potassium, pH, and electrical conductivity using standard procedures. The soil had an organic carbon content of 2.25%, available nitrogen of 348 kg/ha, phosphorus of 144 kg/ha, and potassium of 212 kg/ha. The pH was recorded at 7.40 with an electrical conductivity of 0.138 ds/m.

**Table 1: Soil Fertility Position of Experimental Field**

| S. NO | Particulars | Content | Level | Method adopted |
|---|---|---|---|---|
| **1.** | Organic carbon (%) | 2.25 | Normal | Walkey and black method |
| **2.** | Available Nitrogen(kg/ha) | 348 | Medium | Alkaline permanganate method (Subbiah and Asija, 1956) |
| **3.** | Available Phosphorus(kg/ha) | 144 | High | Olsens's Procedure (Olsen et al. 1954) |
| **4.** | Available potash(kg/ha) | 212 | Low | Flame Photometer |
| **5.** | Soil pH | 7.40 | Normal | Glass electrode ph meter |
| **6.** | Electrical conductivity (dsm-1) | .138 | Normal | Solubridge method |

**Previous Cropping History** The field followed a rotational cropping sequence:

- 2020-21: Maize (Kharif) - Pea (Rabi)
- 2021-22: Maize (Kharif) - Rapeseed (Rabi)
- 2022-23: Rice (Kharif) - Rapeseed (Rabi)

**Experimental Design and Treatments** The experiment was laid out in a Factorial **Randomized Block Design (FRBD)** with three replications and 20 treatment combinations. The treatments consisted of four sowing dates (S1: 25 August, S2: 5 September, S3: 15 September, S4: 25 September) and five Sulphur levels (F1: Control, F2: NPK +20kg s/ha, F3: NPK + 40 kg S/ha, F4: NPK + 60 kg S/ha, F5: NPK only).

**Table 2: Treatments and their combination**

| Season and Year | Rabi/ 2022-23 |
|---|---|
| **Crop** | Rapeseeds (*Brassica napus*) |
| **Variety** | Pant toria -508 |
| **Number of Treatment** | 5 × 4 = 20 |
| **Number of Replication** | 3 |
| **Number of Plots** | 20 × 3 = 60 |
| **Plot Size** | 1.2 × 1.2 m = 1.44 $m^2$ |
| **Spacing** | 30 × 10 cm. |
| **Design** | Factorial Randomized Block Design (FRBD) |

***Corresponding Author:** Kushal Shrestha

**Field Preparation and Crop Management**: The experimental field was plowed, leveled, and divided into plots according to the treatment plan. The Rapeseed variety Pant Toria-508 was used. Fertilizers were applied as per the treatments, and standard agronomic practices were followed for crop management, including irrigation, weeding, and pest control.

**Data Collection and Analysis:** Observations were recorded on soil fertility parameters, growth attributes (plant height, number of branches), and yield components (pods per plant, seed yield, and oil content), and analyzed statistically using ANOVA to determine treatment effects.

This methodology ensured a systematic approach to studying the influence of Sulphur doses and sowing dates on rapeseed growth and yield.

## RESULTS

**Pre-Harvest Observations**

**1. Germination Count**

- Sulphur Management: Maximum germination count was observed with F2 (NPK + 20kg S/ha). F1 (control) had the lowest germination.
- Sowing Date: S4 (25th September) recorded the highest germination count, followed by S3 (15th September). S1 (25th August) had the lowest germination.
- Interaction: F2S4 (NPK+20kg s/ha + 25th September sowing) showed the highest germination count (7.39).

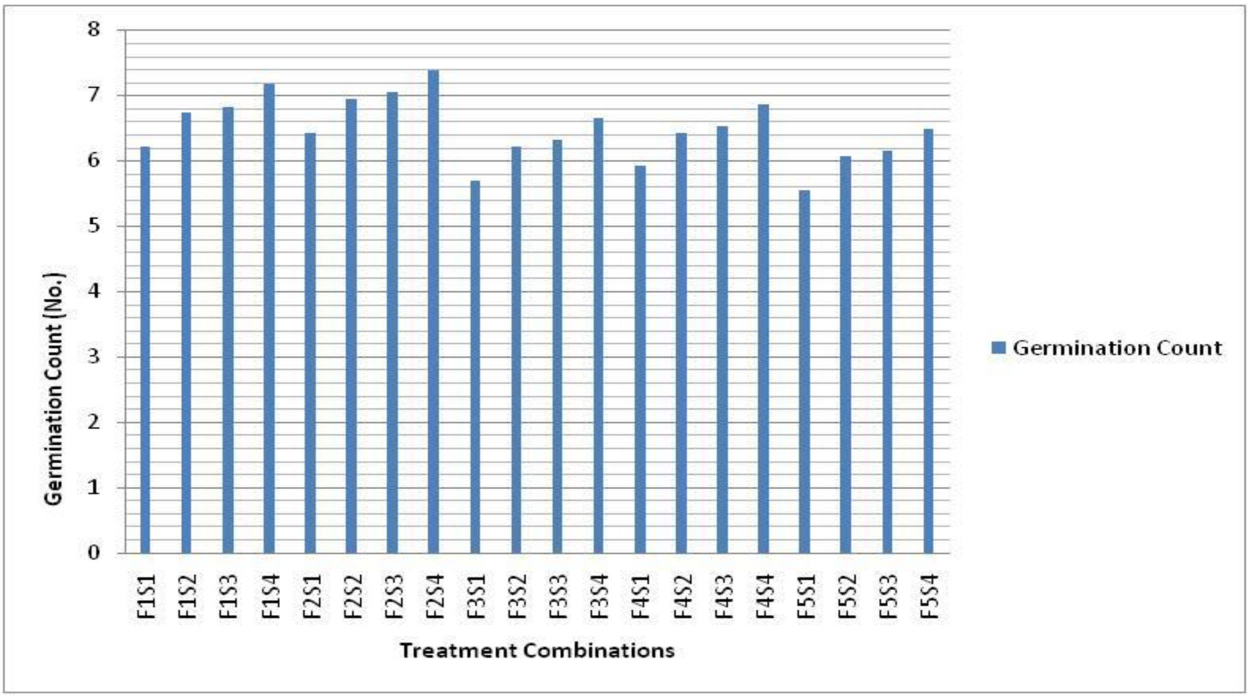


**Figure 1:** Effect of Sulphur and sowing dates on germination count of Rapeseeds crop.

**2. Plant Population**

- Sulphur Management: F2 (NPK + 20kg s/ha) had the highest plant population, while F1 (control) had the lowest.
- Sowing Date: S4 (25th September) recorded the highest plant population, with no significant variation among other dates.
- Interaction: F2S4 (NPK+ 20 kg s/ha + 25th September sowing) showed the highest plant population (7.45).

***Corresponding Author:** Kushal Shrestha 

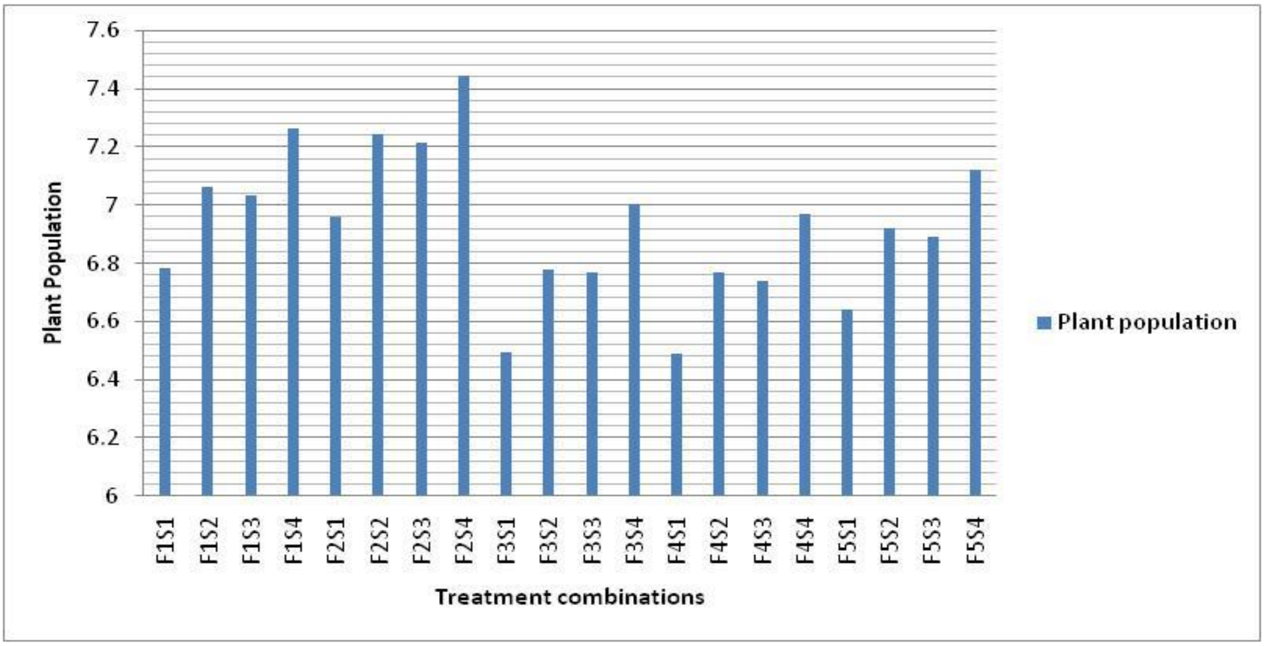


**Figure 2:** Effect of Sulphur and sowing dates on plant population per meter row length of rapeseed crop.

### 3. Plant Height

- Sulphur Management: F2 (NPK+ 20 kg s/ha) resulted in the tallest plants, while F1 (control) had the shortest.
- Sowing Date: S4 (25th September) recorded the tallest plants at 25, 50, and 75 DAS, followed by S3 (15th September).
- Interaction: F2S4 (NPK+20 kg s/ha + 25th September sowing) showed the maximum plant height.

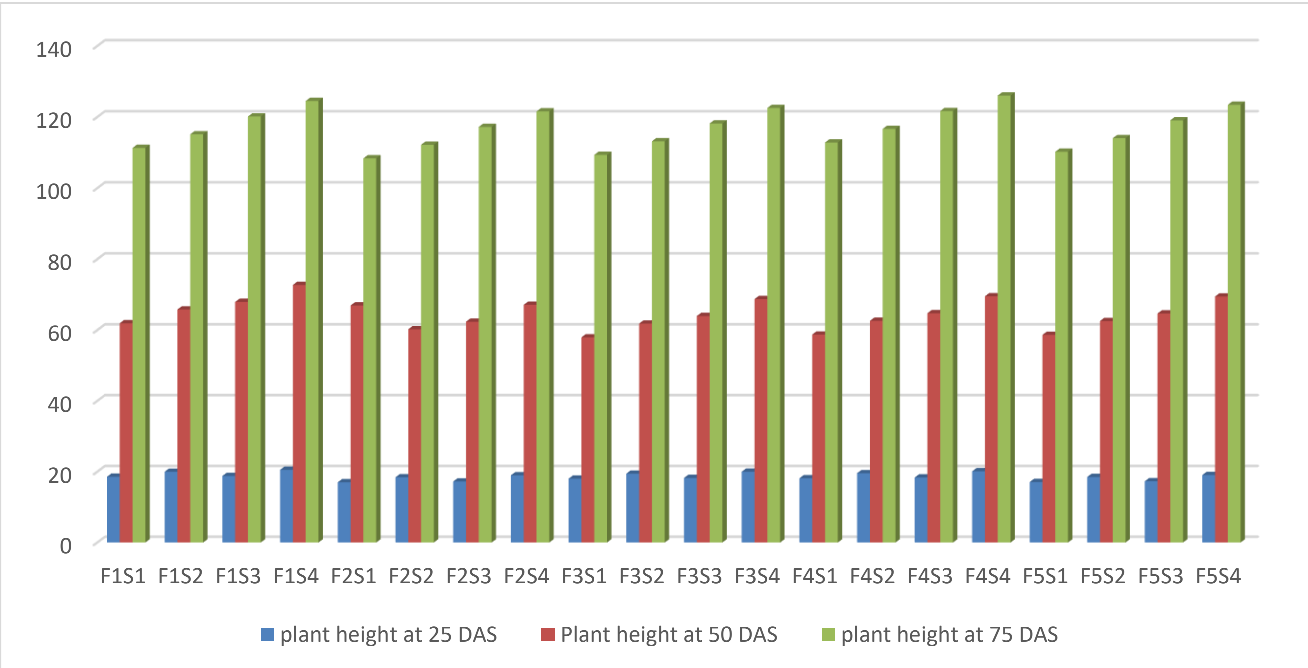


**Figure 3:** Effect of Sulphur management and sowing dates on Plant height (cm) of rapeseed crop at different intervals.

### 4. Root Length

- Sulphur Management: F2 (NPK+ 20 kg s/ha) resulted in the longest roots, while F1 (control) had the shortest.
- Sowing Date: S4 (25th September) recorded the longest roots at 25, 50, and 75 DAS.
- Interaction: F2S4 (NPK+ 20 kg s/ha + 25th September sowing) showed the maximum root length.

***Corresponding Author:** Kushal Shrestha

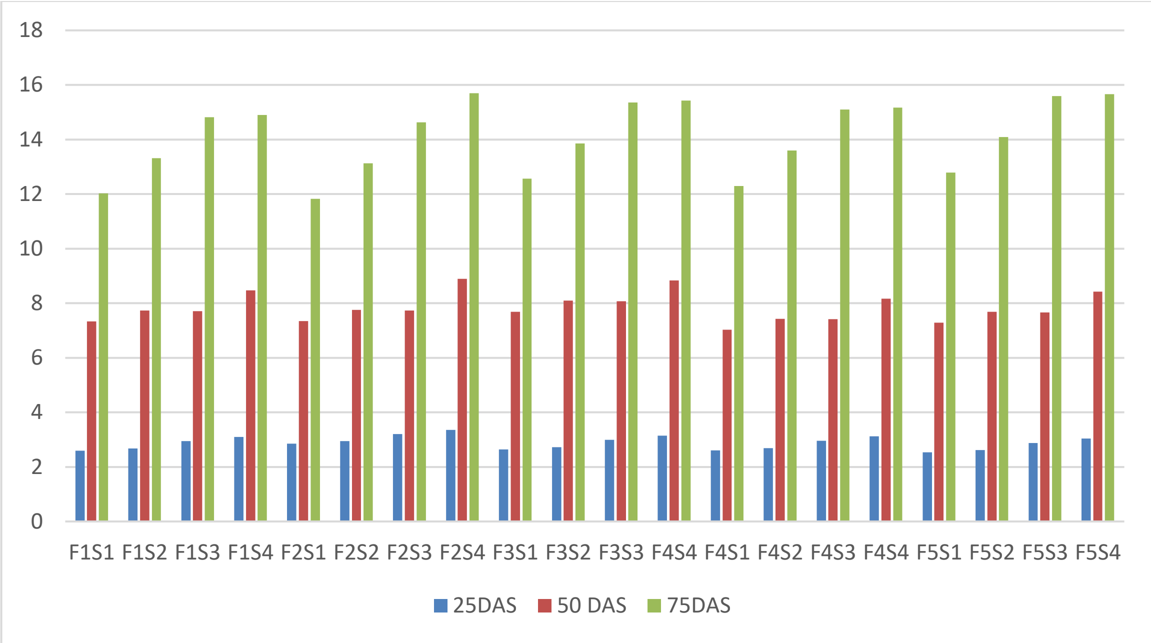


**Figure 4**: Effect of Sulphur and sowing dates on root length of Rapeseed crops.

5. **Dry Matter Accumulation**
   - Sulphur Management: F2 (NPK+20 kg s/ha) resulted in the highest dry matter accumulation, while F1 (control) had the lowest.
   - Sowing Date: S4 (25th September) recorded the highest dry matter accumulation at 25, 50, and 75 DAS.
   - Interaction: F2S4 (NPK+20kg s/ha + 25th September sowing) showed the maximum dry matter accumulation.

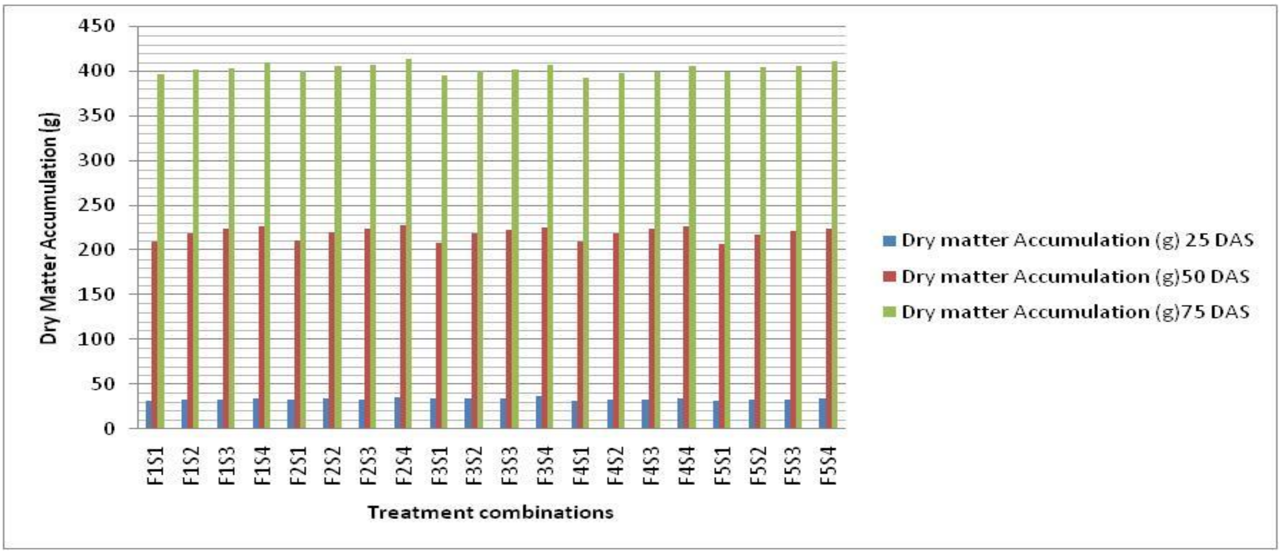


**Figure 5:** Effect of Sulphur and sowing dates on plant dry weight of Rapeseed crops.

**Yield Attributes:**

1. **Number of Seeds per Silique and Test Weight**
   - Sulphur Management: F2 (NPK+20kg s/ha) resulted in the highest number of seeds per silique and test weight, while F1 (control) had the lowest.
   - Sowing Date: S4 (25th September) recorded the highest number of seeds per silique and test weight.
   - Interaction: F2S4 (NPK+20kg s/ha + 25th September sowing) showed the maximum number of seeds per silique and test weight.

2. **Grain Yield, Stover Yield, Harvest Index, and Biological Yield**
   - Sulphur Management: F2 (NPK+ 20kg s/ha) resulted in the highest grain yield, stover yield, harvest index, and biological yield, while F1 (control) had the lowest.

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- Sowing Date: S4 (25th September) recorded the highest grain yield, stover yield, harvest index, and biological yield.
- Interaction: F2S4 (NPK+20kg s/ha + 25th September sowing) showed the maximum grain yield, stover yield, harvest index, and biological yield.

**Nutrient Uptake**

**1. Nitrogen, Phosphorus, and Sulphur Uptake**

- Sulphur Management: F2 (NPK+20kg s/ha) resulted in the highest nutrient uptake, while F1 (control) had the lowest.
- Sowing Date: S4 (25th September) recorded the highest nutrient uptake.
- Interaction: F2S4 (NPK+20kg s/ha + 25th September sowing) showed the maximum nutrient uptake.

NPK with Sulphur fertilization (F2) and sowing on 25th September (S4) resulted in the best growth, yield, and nutrient uptake for rapeseeds. The F2S4 interaction (NPK+20kg s/ha + 25th Sept sowing) showed maximum germination, plant population, height, root length, dry matter accumulation, yield attributes, and nutrient uptake. This combination consistently outperformed others across all parameters.

## DISCUSSIONS

The study titled "Effect of Sulphur and Sowing Date on Soil Fertility, Growth, and Yield of Rapeseeds (Brassica napus L.)" conducted during the 2022-23 rabi season in Dehradun, India, explored the impact of various Sulphur management strategies and sowing dates on rapeseed growth and yield. The findings indicated that the weather conditions, particularly temperature, relative humidity, and rainfall, were favorable for rapeseed growth, with no significant deviations from normal. Among the Sulphur management treatments, the application of NPK along with S fertilizers (F2) led to the highest germination count, plant population, and growth attributes, including plant height, root length, and dry weight. This could be attributed to better Sulphur uptake, which promoted better plant establishment and growth. The sowing date also had a substantial effect, with the 25th September sowing (S4) showing the best results in terms of germination, plant height, yield attributes, and nutrient uptake.

The study further revealed that the optimal Sulphur management and sowing date significantly influenced rapeseed yield. The highest grain yield, straw yield, and harvest index were observed under the F2 (NPK+20kg s/ha fertilizers) treatment, with the 25th September sowing (S4) also showing the highest yield outcomes. This can be attributed to improved nutrient uptake, better growth during the vegetative and reproductive stages, and optimal environmental conditions during the sowing period. Delayed or early sowing reduced crop performance, with early sowing being prone to temperature stress, while late sowing affected maturity and yield. The results highlighted the importance of both Sulphur management and sowing date in optimizing rapeseed yield and nutrient uptake, with F2 and S4 being the most effective treatments.

## CONCLUSION

The study concluded that the combined application of NPK and Sulphur significantly improved the growth, yield attributes, and nutrient uptake of Rapeseeds (Brassica napus). Maximum plant height, root length, dry matter accumulation, and seed yield were observed with higher NPK and 20kg s/ha Sulphur application. Delayed sowing enhanced germination, plant population, and yield, with the 25th September sowing date showing the best results. The findings suggest that balanced nutrient management, particularly Sulphur application, and optimal sowing time are crucial for maximizing Rapeseed productivity in Dehradun.

## REFERENCES

1. Alam, M., Ahmed, K., Mollah, M., Tareq, M., & Alam, J. (2015). Effect of planting dates on the yield of mustard seed. *International Journal of Applied Sciences and Biotechnology, 3*(4), 651-654. https://doi.org/[insert DOI if available]
2. Aziz, M., Chakma, R., Ahmad, M., Rahman, A. K. M. M., & Roy, K. (2011). Effect of sowing dates on the growth, development, and yield of mustard in the hilly areas. *Journal of Experimental Biosciences, 2*(1), 33-36.
3. Charak, A. S., Dadheech, R. C., & Chauhan, G. S. (2006). Growth and productivity of rapeseeds (*Brassica rapa* var. *dichotoma*) as influenced by sowing time, row spacing, and nitrogen levels. *Indian Journal of Agriculture Science, 76*(11), 685-687.
4. Kumar, A., Lal, M., Mohan, M., Kumar, M., & Kumar, N. (2018). Effect of different sowing dates on yield and yield attributes of Indian mustard (*Brassica juncea* L.) genotypes. *International Journal of Pure and Applied Bioscience, 6*(2), 848-853.
5. Mitiku, W., Temedo, T., Singh, T. N., & Teferi, M. (2014). Effect of integrated sulfur management on yield and yield components of barley (*Hordeum vulgare* L.) in Keffa Zone, southwestern Ethiopia. *Science Technology Arts Research Journal, 3*(2), 34–42.
6. Yadav, A., Singh, A. K., Chaudhary, R., & Mishra, S. R. (2018). Effect of planting geometry on growth and yield of mustard (*Brassica juncea* L.) varieties. *Journal of Pharmacognosy and Phytochemistry, 7*(3), 2624-2627.

***Corresponding Author:** Kushal Shrestha