International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 09 Issue 07 July 2026
DOI: 10.47191/ijcsrr/V9-i7-51, Impact Factor: 8.048
IJCSRR @ 2026
www.ijcsrr.org

Effects of Varying Levels of Poultry Manure on Growth and Yield of Canola (Brassica napus L.) under Kabul Agro-climatic Conditions

Murtaza Nabizada[1*], Abdul Khalil Afghani[2]
[1] Scholar of M.SC. Degree at Agronomy Department of Kabul, Agriculture Faculty, Kabul, Afghanistan
[2] Department of Agronomy, Agriculture Faculty, Kabul University, Kabul, Afghanistan

ABSTRACT: Canola (Brassica napus L.) is one of the key oilseed crops worldwide, serving as a vital source of edible oil, livestock feed, and biofuel. In Afghanistan, canola production faces significant challenges due to declining soil fertility and over-reliance on expensive chemical fertilizers. Poultry manure, as a low cost and nutrient-rich organic fertilizer, offers a sustainable alternative for improving crop productivity. However, limited scientific information is available regarding the optimal poultry manure application rate for canola under Kabul's agro-climatic conditions. Therefore, an experimental research was conducted at Kabul University Agricultural Research Farm during the 2025 cropping season using Randomized Complete Block Design (RCBD) with three replications and four treatments. The study aimed to evaluate Effects of Different Levels of Poultry manure on Growth, Yield, and Yield Components of Canola. The findings of the study revealed that the application of poultry manure significantly influenced on growth, yield and yield components of canola. Overall, the application of 8-ton poultry manure ha^{-1} had better performance than control. The maximum plant height (117.45 cm), number of branches plant^{-1} (5.65), number of leaves plant^{-1} (39.77), number of siliques plant^{-1} (184.61), silique length (6.01 cm), number of seeds silique^{-1} (18.39), thousand seed weight (3.40 g), seed yield (2.74 t ha^{-1}), biological yield (9.87 t ha^{-1}), and harvest index (27.76%) were all recorded in T4. The lowest values for all parameters were observed in the control treatment (T1). It is recommended that use 8 tons of poultry manure ha-1 in order to realize optimal seed yield and biological yield of the crop.

KEYWORDS: canola, growth, poultry manure, yield

INTRODUCTION

Canola (Brassica napus, Brassica rapa) is among the major oilseed crops in the world that are not only used for cooking, making salads, and frying of food, but are also commonly used in the production of other food products such as margarine (Gan et al., 2016). Canola crop was bred from the rape seed through breeding programs at prairies, the University of Manitoba through Dr Stefansson and Dominion Forage Crop Laboratory (currently known as Agriculture and Agri-food Canada) by Dr Downey (Kanmi-Obembe, 2022). Oilseed rape (Brassica napus L.) is an important source of edible oil and livestock feed and is a potential crop for the production of biofuel.

Canola is the world's second most produced oilseed. it represents a promising source of novel protein. This is due to its high nutritional value, reflected in a well-balanced amino acid profile, as well as its highly desirable technological and functional properties (Chmielewska et al., 2021). canola seed includes approximately 3–4.5% moisture, 40–45% oil, 19–28% crude protein, 5–6% ash content, 8–10% soluble sugars, and 14–15% crude fiber (Tanwar & Goyal, 2021). Biodiesel derived from various vegetable oils, particularly canola (Brassica napus L.), has become a popular renewable alternative energy source. Its use has expanded significantly in recent years due to its biodegradability, low emission profile, and production from non-toxic feedstocks such as vegetable and animal oils (Gidik1 et al., 2023). A report from Deep Market Insights shows that the global canola oil market was valued at USD 38633.94 million in 2025 and is projected to reach USD 54825.1 million by 2034, with a compound annual growth rate (CAGR) of 4% between 2026 and 2033 (Global Canola Oil Market Size, Share & Growth Analysis By [2034], n.d.)To meet the increasing demand of oilseed rape, strategies should be developed to improve yield with quality maintained. With the growth of world population and climate and energy issues being major challenges, the demand for the production of oilseed rape is increasing greatly (Tian et al., 2020).

Effective canola production relies on proper management of nutrients, as fertilizer applications bridge the gap between the nutrients supplied by the soil and the demands of the crop (Crittenden et al., 2024). The continuous application of chemical

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 09 Issue 07 July 2026
DOI: 10.47191/ijcsrr/V9-i7-51, Impact Factor: 8.048
IJCSRR @ 2026
www.ijcsrr.org

fertilizers reduces soil organic matter, degrades soil quality, causes soil compaction, and contaminates water, soil, and air, thereby posing significant environmental risks. Over use of chemical fertilizers weaken soil microbial activity, alter soil pH, lead to soil acidification, increase plant pests, and cause soil crusting. These effects consequently reduce organic matter content, decrease humus and beneficial soil organisms, disrupt plant growth, and even contribute to greenhouse gas emission (Pahalvi et al., 2021). Eutrophication and soil acidification are side effects of the excessive use of chemical fertilizers, especially nitrogen and phosphorus, which penetrate into the lower layers of the soil through runoff (Liu et al., 2022).

The chicken industry is important for billions of people because it makes nutrition and a source of income and serves as a cornerstone for global economic progress and food stability. According to a survey conducted in 2023, the global chicken market will grow to approximately \$487.39 billion by 2027. The global chicken producers are the United States, Brazil, China, the European Union, India, and Russia (Hemavarshini et al., 2025). Poultry manure (PM) is a potential source of organic fertilizer for its high nutrient content and low cost. PM, which is rich in nitrogen, phosphorus, potassium, and other essential elements, has been shown positive effect on soil fertility, increasing crop yield, and enhancing the quality of agricultural product (Rasool et al., 2023).

Daronch et al (2020) stated that the highest grain yield (2503 kg ha^{-1}) and oil content (43.2%) were achieved with 8 t ha^{-1} of poultry litter. Nevertheless, no significant differences were observed in plant height, number of siliques per plant, number of grains per silique, or thousand-grain weight across the different litter rates. Lin et al (2020) explored the integration effects of poultry litter and mineral nitrogen on growth and yield of winter canola in the southeastern United States, focusing on the application of poultry litter as an alternative nutrient source for crops. Their study revealed that the combined treatment P68U112 (68 kg N from poultry litter and 112 kg N from urea) produced a yield equivalent to the treatment with 180 kg N from urea alone in canola. Shilan et al (2022) examined the effect of NPK and organic fertilizers on yield and seed oil content of rapeseed (Brassica napus L.). Their study found that application of 1200 kg ha^{-1} chicken manure alone significantly increased seed yield (2172.6 kg ha^{-1}) and oil yield (719.5 kg ha^{-1}) compared to control. Akram et al(2024) demonstrated that combining organic amendments with chemical fertilizers—especially cow dung and poultry manure—led to noticeable improvements in rapeseed yield, yield-related traits, and soil fertility compared with the use of chemical fertilizers alone or no fertilizer application.

Afghanistan is an agricultural country where the majority of its population are engaged in agriculture and livestock. Canola has been cultivated in Afghanistan in its traditional form for decades, and its oil was used in the fuel for lamps to illuminate homes. This crop is grown both under irrigation and in rain-fed conditions, its rain-fed areas are mainly in the northern and northeastern provinces, as well as in Kandahar and Helmand. Canola is one of the oilseed plants, with seeds containing 42-45% oil and the meal having 36-40% protein. Therefore, the cultivation of canola has vital importance for the production of cooking oil, animal feed, ensuring food security, strengthening the livestock sector, and ultimately contributing to the economic growth of the country. Reliance on chemical fertilizers and a deficiency of organic matter lead to depletion of soil Fertility in Afghanistan particularly in Kabul. Poultry manure, as an affordable and easily available organic fertilizer enrich of nitrogen, phosphorus, and potassium, can play a significant role in improving crop growth and yield. Despite its importance, limited scientific information and data is available regarding optimal poultry manure application rate for canola cultivation under agro-climatic conditions of Kabul. Therefore, conducting a field experimental research entitled “Response of Canola (Brassica napus L.) to different levels of poultry manure under Kabul Agro Climatic Condition is essential.

This research aims:

To evaluate Effects of Different Levels of Chicken Manure on Growth, Yield, and Yield Components of Canola.

MATERIALS AND METHODS

The study was conducted the Kabul University Agricultural Research Farm located in Kabul, Afghanistan, during The 2025 cropping season (April to August) which generally has a semi-arid climate with cold winters and mild summers. The farm is situated at an altitude of Approximately 1,800 meters above sea level. Before sowing, a composite soil sample was taken to determine the soil properties. Representative soil samples were collected from a depth of 0–30 cm in the farm field using an auger soil sampling tool. The samples were analyzed for baseline nutrient content, pH, and organic matter. The soil in the research area was identified as sandy loam with moderate fertility. A Randomized Complete Block Design (RCBD) with three replications was used for the study. Four levels of poultry manure were tested, including a control treatment (0 t ha^{-1}) and three manure rates of 4, 6, and 8 t ha^{-1}. Two separate fields, each with 12 plots and 4 treatments replicated three times, were used.

Table 1: Physical and Chemical Properties of the Field Soil

pH	Ec(ms/cm)	Caco3	TN%	OM(%)	CEC(meq/100g)	P2O5	Soil Texture
8.3	0.259	12	0.02	2.7	16.4	1.83	Sandy loam
High	Medium	Medium	Medium	Medium	Medium	Low	Medium rate
>8.2	0.8-2.5	8-16	0.002-0.09	2-5	5-25	>25	

The experimental area is under semi-arid climate characterized by hot Summers, low relative humidity, and limited rainfall. Data received from meteorological station of Agricultural Research Institute of Afghanistan (ARIA) showed that the area received a total rainfall of 274.7 mm during the year 2025, of which 9 millimeters occurred during the plant growing season. During the experimental year (2025), the recorded maximum temperatures during the growing season (April to August) ranged from 33.8C0to 39.0 C0, while minimum temperatures ranged from 21C0 to 28 C0.

Table 2: Meteorological Data of Kabul During Growing Season (April to August 2025)

Month	Average daily minimum temperature	Average daily maximum temperature	Rainfall (mm)	Relative Humidity
April	21	33.8	0	38
May	24	37.0	0	42
June	28	39.0	0	46
July	27	35.1	8	68
August	26	34.7	1	69

The land preparation included two plowings and one harrowing, followed by manual leveling to create uniform experimental plots. After leveling, the field was divided into plots, each having an area of 4 m² (2 × 2 m), and seven rows were maintained in each plot. The required amount of poultry manure was mixed thoroughly with the soil in each plot at final land preparation/harrowing before seed sowing.

A high-yielding variety of canola (Hyola 50) was used as the experimental planting material in this research. The seed was obtained from the Agronomy Department, Faculty of Agriculture, Baghlan University, Afghanistan. The germination percentage was 98%. Canola seeds were sown on April 25, 2025 as per treatment, using manual furrow sowing, with row Spacing of 30 cm and intra-row spacing of 30 cm, ensuring optimal plant density and uniform growth. Weed control was done manually by hand using a hoe every week. Each weeding operation was completed on the same day for all the blocks to ensure uniform growing conditions.

The first irrigation of the experiment was applied before sowing, while subsequent irrigations were applied every eight days. To prevent damage from Army cutworms and Diamondback Moth, cypermethrin was applied at a rate of 2 cc per liter of water for two rounds of application. Harvesting was carried out manually from the net plot area at physiological maturity, once the pods had turned yellowish-brown.

Data collection was carried out at harvest time. Five representative plants per plot were randomly selected and tagged for measurements. The average of these five plants was used to minimize variability and improve data reliability. The collected data were computed and analyzed statistically using the analysis of variance (ANOVA) technique with the help of a computer package program Statistical Tools for Agricultural Research (STAR) and the mean differences were adjusted by the Least Significance Difference (LSD) test at 5% and 1% level of probability.

RESULTS

The findings of the study revealed that the application of poultry manure significantly influenced on growth, yield and yield components of canola. Overall, the application of 8-ton poultry manure per hectare had better performance than control, by increasing in plant height plant height, number of branches per plant, number of leaves per plant, number of siliques per plant, silique length, number of seeds per silique, thousand seed weight, seed yield, biological yield and harvest index.

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 09 Issue 07 July 2026
DOI: 10.47191/ijcsrr/V9-i7-51, Impact Factor: 8.048
IJCSRR @ 2026
www.ijcsrr.org

Vegetative growth of canola (plant height, no of branch, leaves, silique and silique length/plant)

The highest values in terms of plant height (117.45 cm), number of branches per plant (5.65), number of leaves per plant (39.77), number of silique per plant (184.61) and length of silique (6.01 cm) were recorded with T4, receiving 8-ton ha^{-1} poultry manure. The lowest values were observed with control.

Table 3: Influence of poultry manure on Growth and morphological attributes of Canola

Treatments	Plant Height (cm)	Branch Plant^{-1} (no.)	Leaves Plant^{-1} (no.)	Silique Plant^{-1} (no.)	Silique Length (cm)
T1	82.07 d	3.50 c	27.07 c	115.50 d	3.69 d
T2	96.16 c	4.45 b	36.57 b	139.21 c	4.73 c
T3	108.79 b	5.34 a	38.59 a	172.64 b	5.58 b
T4	117.45 a	5.65 a	39.77 a	184.61 a	6.01 a
$LSD_{0.05}$	4.198	0.3702	1.3852	7.582	0.2462
CV%	2.08	3.91	1.95	2.48	2.46

T1: Control; T2: 4t ha^{-1} poultry manure; T3: 6t ha^{-1} poultry manure; T4: 8t ha^{-1} poultry manure

Yield and yield components improvement (no of seeds silique-1, TSW, seed yield, biological yield and harvest index)

Yield and yield components of canola also significantly affected by treatment effects (Table 4). maximum number of seeds per silique (18.39), thousand seed weight (3.40 g), seed yield (2.74 t ha^{-1}), biological yield (9.87 t ha^{-1}), and harvest index (27.76%) were calculated with treatment received highest amount of poultry manure (T4), whereas the minimum number of yield and yield components were obtained from control.

Table 4: Influence of poultry manure on Yield and yield components of Canola.

Treatments	Seeds Silique^{-1} (no.)	TSW (g)	Seed Yield (t/ha)	Biological yiel (t/ha)	Harvest Index (%)
T1	12.36 d	2.29 d	1.10 d	5.31 d	20.67 d
T2	15.74 c	2.61 c	1.84 c	7.93 c	23.12 c
T3	17.13 b	3.00 b	2.23 b	9.21 b	24.16 b
T4	18.39 a	3.40 a	2.74 a	9.87 a	27.76 a
$LSD_{0.05}$	1.08	0.1269	0.1496	0.5449	0.6372
CV%	3.40	2.25	3.79	3.38	1.33

T1: Control; T2: 4t ha^{-1} poultry manure; T3: 6t ha^{-1} poultry manure; T4: 8t ha^{-1} poultry manure

DISCUSSION

The findings of the study indicated that the increasing the amount of poultry manure greatly enhanced all growth and yield parameters, such as plant height, number of branches per plant, number of leaves per plant, number of silique per plant, length of silique per plant, number of seeds per silique, TSW, biological yield, and harvest index.

The highest plant height (117.45 cm) resulted in Treatment 4 and the lowest one (82.07 cm) is recorded from treatment with no application of manure. (Shilan et al., 2022) noted that there were significant improvements in the yield parameters of rapeseed at higher rates of poultry manure application (up to 1200 kg ha^{-1}), implying that organic matter applications improve vegetative growth. Similar results have been observed by (Adim et al., 2022), who found that the combined use of poultry manure along with chemical and bio-fertilizers significantly improved growth parameters of canola plants including the plant height.

The treatment which received 8-ton ha-1 poultry manure produced the highest number of branches per plant (5.65) and lowest number were obtained from control. The results of our research are generally consistent with previous research confirming the positive effect of poultry manure on branching in Brassica species. According to (Akram et al., 2024), use of chemical fertilizer along with 3 t ha^{-1} poultry manure caused an increase in branch number of 41.2% over control, thus validating our observation on branching due to the use of poultry manure. (Meitei et al., 2019) observed an increase in branch number of

International Journal of Current Science Research and Review
ISSN: 2581-8341
Volume 09 Issue 07 July 2026
DOI: 10.47191/ijcsrr/V9-i7-51, Impact Factor: 8.048
IJCSRR @ 2026
www.ijcsrr.org

Brassica napus when only 10 t ha^{-1} poultry manure was used. In contrast, Daronch et al (2020) found no significant effect of poultry litter on branch number in Brazil, which likely reflects differences in climate, cultivar, and higher baseline soil fertility in their study region.

The maximum number of leaves plant-1 was observed in treatment 4 while minimum number attained from control. Our finding is generally in line with those of (Kiran et al., 2017), who examined the influence of organic manures and NPK on growth attributes of turnip (Brassica rapa L.). The authors indicated that poultry manure (10t ha^{-1}) application showed significant increase in the number of leaves (10.72 leaves per plant) compared to the control treatment (7.03 leaves) at 52.4%, whereas NPK treatment yielded maximum leaf numbers (13.22 leaves per plant) at 87.9%. The results have proven that poultry manure, being a nutrient-rich organic fertilizer, positively affects leaf formation in Brassica plants. Nevertheless, the amount of leaves formed in our experiment (39.77 leaves per plant in T4) was significantly greater compared to those of (Kiran et al., 2017). This discrepancy can be attributed to inherent differences in plant morphology and growth habit.

The variance analysis for 4 different application rate of poultry manure found to be significant on number of silique per plant. The control treatment showed lower number of silique per plant (115.50) compared to the 8-ton ha^{-1} poultry manure. It was stated by Shilan et al (2022) that the increase in the amount of poultry manure usage from 0-1200 kg ha^{-1} led to the significant increase in the number of pods per plant (180.71) relative to the control (81.39), indicating a 122.1% increase despite the inclusion of poultry manure with NPK fertilizers in their study. The closest study to our work was performed by Volodina et al (2024) in Russia where the same rates of poultry manure were used (4, 6, and 8 t ha^{-1}) for spring rapeseed, with 8 t ha^{-1} yielding the highest pod number per plant (48.87) or 109.7% higher than the control group.

The data showed that application of 8-ton poultry manure produced the highest length of silique (5.58) and it was increased 62.9% over control. This is similar to other studies that have demonstrated a positive influence of the use of poultry manure on this yield component in rapeseed crops. In their study, (Shilan et al., 2022) showed that as more poultry manure is applied up to 1200 kg ha^{-1}, there was a significant increase in the silique length (5.68-6.76 cm) as compared to the control (3.62-4.75 cm) that is very close to what we found in this study (T4: 6.01 cm). In the same way, the study of (Meitei et al., 2019) showed that as the combination of 5 t ha^{-1} poultry manure with ½ N gave the highest silique length (8.56 cm).

Data analysis revealed a significant impact of varying level of poultry manure on number of seeds per silique. The highest number of seeds per silique produced by treatment 4 (18.39) whereas lowest value observed in control. According to Meitei et al (2019), the combination of 5 t ha^{-1} of poultry manure and ½ nitrogen resulted in the maximum number of seeds per silique (27.3). Also, poultry manure alone at 10 t ha^{-1} increased the seeds per silique by 6.1% compared to control (24.3 vs. 22.9). The relatively high seed numbers recorded by Meitei et al (2019) compared to our experiment (27.3 vs. 18.39) are because supplementary nitrogen application, differences in soil properties and climatic conditions between the two locations.

The outcome of the study showed that T4 was produced the highest value (3.40 g) than control. Shilan et al (2022) noted that there was a significant increase in the 100-seed weight from 0.173 g in the control treatment to 0.251 g when poultry manure was used at a rate of 1200 kg ha^{-1}, and this corroborates our results on improvement in seed weight with an increased amount of poultry manure. Furthermore, Adim et al (2022) observed that poultry manure treatment alone (T3) significantly enhanced 1000-seed weight when compared to the control, thus supporting our finding that poultry manure improves seed filling. similar to our findings, Volodina et al (2024) observed that an application rate of 8 t ha^{-1} yielded the maximum value of the 1000-seed weight (4.45 g) which shows an increase of 27.1% over the control (3.50 g). The difference in thousand seed weight in our experiment (3.40 g) is lower than that reported by Volodina et al (2024) (4.45 g); this may be due to the cultivar differences since our experiment had a hybrid variety of Hyola 50 and Climatic conditions.

Treatment 4, produced highest seed yield (2.74 t/ha) and lowest seed yield (1.10 t/ha) calculated with control. Our research finding is consistent with past studies that show the effect of poultry manure on improving the productivity of rapeseed. According to (Lin et al., 2020), the application of poultry litter (68 kg N ha^{-1}) along with urea (112 kg N ha^{-1}) yielded the maximum grain yield (2287 kg ha^{-1}), an increase of 73.4% over the unfertilized control, while the application of poultry litter ($P_{180}U_0$) gave a significantly lower grain yield (1480 kg ha^{-1}), which indicated that poultry manure alone may not always fulfill the nitrogen requirement of crops for growth because of delayed mineralization.

The result of biological yield in our experiment (85.9% increase in T4 compared to T1) is in line with previous literature findings although the level of increase differs. As per Meitei et al (2019), it was found that the highest biological yield (10.92 t

ha^{-1}) was obtained by using 5 t ha^{-1} poultry manure along with ½ nitrogen treatment, which indicated 197.5% increase compared to the control; however, this percentage is much higher than our experiment results due to the use of additional nitrogen fertilization for increasing grain and straw yield and differences between climatic conditions.

The Harvest index of canola (Brassica napus L.) was influenced significantly by different application rate of poultry manure. The highest value of harvest index recorded with T4 (27.7) whereas the lowest was attained with control. Meitei et al (2019) noted that 5 t ha^{-1} poultry manure along with ½ nitrogen had the highest harvest index (23.6%), which is lower as compared to our observations (27.76% in T4). The above variation could be because of the differences in the genetic potential of cultivar used and agro climatic differences between two locations.

There are several limitations with the current study which should be noted. First, the experiment was carried out for one year only, and just at two sites, hence limiting the ability to extrapolate the results to other years and different ecological regions. There were only four poultry manure applications tested in this experiment, and there was no testing done on how it affects the crop in conjunction with chemical fertilizers. Moreover, the use of only one variety of the crop (Hyola 50) makes the response of other varieties unknown, and there is no evaluation of quality factors like oil and protein content. The particular climate conditions such as high temperatures during summer (up to 39°C) and low rainfall might have affected the results.

CONCLUSION

This study was designed to assess the effect of different rates of poultry manure on the growth, yield, and yield components of canola (Brassica napus L.) under the agro-climatic condition of Kabul. The results revealed that there was an improvement in the growth, yield, and yield components of canola due to the use of poultry manure. Treatment 4 (8 t ha^{-1}) was observed to produce the highest plant height (117.45 cm), highest number of branches per plant (5.65), and highest number of leaves per plant (39.77). However, the lowest values were observed in the control treatment (T1). similarly, all yield parameters were significantly affected by the application of poultry manure. The greatest number of pods per plant (184.61), pod length (6.01 cm), number of seeds per pod (18.39), and seed weight per thousand (3.40 g) was observed for the T4 treatment while the control treatment (T1) had the least value for all yield parameters. The treatment T4 (8 t ha^{-1}) was found to be the best treatment in terms of getting the maximum seed yield of the canola. Thus, it is recommended to apply 8 t ha^{-1} of well-decomposed poultry manure to the canola farmers in Kabul and similar agro-ecological areas

REFERENCES

1. Adim, G., Malekzadeh, E., … E. D.-… (Scientific J. of, & 2022, U. (2022). Evaluation of the integrated effect of chemical and bio-organic fertilizers on yield and yield components of rapeseed. *Agrieng.Scu.Ac.IrG Adim, E Malekzadeh, E Dordipour, F Kiani, H Mokhtarpour, S MoazzemiAgricultural Engineering (Scientific Journal of Agriculture), 2022•agrieng.Scu.Ac.Ir*. https://agrieng.scu.ac.ir/article_17875_28570d83fee62c259c7f4bfdac5912a8.pdf
2. Akram, S., Sarkar, M. J., Alim, S. M. A., Nahar, N., Toma, N. I., Ali, S. Y., Malaker, S., Al Islam, M. Z., & Hossain, M. S. (2024). Assessing the Integrated Effect of Organic and Inorganic Amendments on Soil Fertility and Rapeseed (Brassica napus L.) Yield. *Jagroforenviron.ComS Akram, MJ Sarkar, SMA Alim, N Nahar, NI Toma, SY Ali, S Malaker, MZ AlJournal of Agroforestry and Environment, 2024•jagroforenviron.Com*102–97 ,(2)*17*,. https://doi.org/10.55706/jae
3. Chmielewska, A., Kozłowska, M., Rachwał, D., Wnukowski, P., Amarowicz, R., Nebesny, E., & Rosicka-Kaczmarek, J. (2021). Canola/rapeseed protein–nutritional value, functionality and food application: a review. *Critical Reviews in Food Science and Nutrition*, *61*(22), 3836–3856. https://doi.org/10.1080/10408398.2020.1809342
4. Crittenden, S., Clayton, G., Boyce, M., Deng, X., & Grant, C. (2024). Canola variety, nitrogen, phosphorus, and sulfur fertilization affect yield, quality, and fatty acid profile. *Cdnsciencepub.ComS Crittenden, G Clayton, M Boyce, X Deng, C GrantCanadian Journal of Plant Science, 2023•cdnsciencepub.Com*2–1 ,(1)*104*, https://doi.org/10.1139/CJPS-2023-0055
5. Daronch, A., Costa, A. da, … M. L.-J. of E., & 2020, U. (2020). Agronomic Characteristics and Productivity and Oil Content of Canola Crop as a Function of Poultry Litter Use. *Hal.ScienceAGCC Daronch, ACT Da Costa, MDC Lana, JBD Júnior, JDA BarbosaJournal of Experimental Agriculture International, 2020•hal.Science*. https://hal.science/hal-05369913/
6. Gan, Y., Neil Harker, K., Randy Kutcher, H., Gulden, R. H., Irvine, B., May, W. E., O, J. T., Gan, Y., Harker, K., Kutcher,

H., Gulden, R., & May, W. (2016). Canola seed yield and phenological responses to plant density. *Cdnsciencepub.ComG Yantai, KN Harker, HR Kutcher, RH Gulden, B Irvine, WE May, JT O'DonovanCanadian Journal of Plant Science, 2016•cdnsciencepub.Com*159–151 ,(1)*96*,. https://doi.org/10.1139/cjps-2015-0093

7. Gidik[1], B., Gül[2], V., Önemli[3], F., Girgel[4], Ü., & Tarihi, G. (2023). Fatty Acid Composition and Biodiesel Quality of Brassica nigra, Brassica napus and Sinapis arvensis Seeds. *Bahçe*, *52*(1), 1–6. https://doi.org/10.53471/BAHCE.1085986
8. *Global Canola Oil Market Size, Share & Growth Analysis By [2034]*. (n.d.). Retrieved July 8, 2026, from https://deepmarketinsights.com/vista/insights/canola-oil-market/global
9. Hemavarshini, M. P., Thiyageshwari, S., Selvi, D., Anandham, R., Thirunavukkarasu, M., Sivasubramanian, K., & Jegadeeswari, D. (2025). Sustainable Management of Chicken Waste: Exploring Conversion Technologies for Environmental Benefits. *Frontiers in Bioscience - Elite*, *17*(2). https://doi.org/10.31083/FBE25930
10. Kanmi-Obembe, O. (2022). Effect of row spacing and seeding rate to obtain optimal canola yield*2022* .. https://harvest.usask.ca/bitstreams/7267d397-a50e-4a9d-a10b-fdbb90245bc4/download
11. Kiran, M., Waseem, K., & Khan, D. I. (2017). IMPACT OF DIFFERENT ORGANIC MANURES AND NPK APPLICATION ON THE GROWTH AND YIELD OF TURNIP (BRASSICA RAPA L). *Pakistan Journal of Science*, *69*(2). https://doi.org/10.57041/VOL69ISS2PP
12. Lin, Y., Watts, D. B., Torbert, H. A., Howe, J. A., & Feng, Y. (2020). Integration of poultry litter and mineral nitrogen on growth and yield of winter canola. *Agronomy Journal*, *112*(4), 2496–2505. https://doi.org/10.1002/AGJ2.20158
13. Liu, M., Linna, C., Ma, S., Ma, Q., Song, W., Shen, M., Song, L., Cui, K., Zhou, Y., & Wang, L. (2022). Biochar combined with organic and inorganic fertilizers promoted the rapeseed nutrient uptake and improved the purple soil quality. *Frontiers in Nutrition*, *9*. https://doi.org/10.3389/FNUT.2022.997151/FULL
14. Meitei, A., Sci, A. B.-I. J. C. M. A., & 2019, U. (2019). Effect of Different Organic Manures with Combination of Inorganic Fertilizers on Transplanted Gobhi Sarson (Brassica napus L.). *Academia.EduAM Meitei, A BajpayInt. J. Curr. Microbiol. App. Sci, 2019•academia.Edu*. https://www.academia.edu/download/68393081/A._20Malemnganba_20Meitei_20and_20Anurag_20Bajpay.pdf
15. Pahalvi, H., Rafiya, L., Rashid, S., Biofertilizers, B. N.-… and, 2, V., & 2021, U. (2021). Chemical fertilizers and their impact on soil health. *SpringerHN Pahalvi, L Rafiya, S Rashid, B Nisar, AN KamiliMicrobiota and Biofertilizers, Vol 2: Ecofriendly Tools for Reclamation of, 2021•Springer*. https://link.springer.com/chapter/10.1007/978-3-030-61010-4_1
16. Rasool, A., Ghani, A., Nawaz, R., Ahmad, S., Shahzad, K., Rebi, A., Ali, B., Zhou, J., Ahmad, M. I., Tahir, M. F., Alwahibi, M. S., Elshikh, M. S., & Ercisli, S. (2023). Effects of Poultry Manure on the Growth, Physiology, Yield, and Yield-Related Traits of Maize Varieties. *ACS Omega*, *8*(29), 25766–25779. https://doi.org/10.1021/acsomega.3c00880
17. Shilan, H., Sciences, S. H.-I. journal of agricultural, & 2022, U. (2022). Effect of NPK and organic fertilizers on yield and seed oil content of rapeseed (Brassica napus L.). *Jcoagri.Uobaghdad.Edu.IqHS Shilan, SJ HamaIraqi Journal of Agricultural Sciences, 2022•jcoagri.Uobaghdad.Edu.Iq*. https://www.jcoagri.uobaghdad.edu.iq/index.php/intro/article/view/1600
18. Tanwar, B., & Goyal, A. (2021). Oilseeds: health attributes and food applications*2021* .. https://link.springer.com/content/pdf/10.1007/978-981-15-4194-0.pdf
19. Tian, C., Zhou, X., Liu, Q., Peng, J., … Z. Z.-C. & P., & 2020, U. (2020). Increasing yield, quality and profitability of winter oilseed rape (Brassica napus) under combinations of nutrient levels in fertiliser and planting density. *Connectsci.AuC Tian, X Zhou, Q Liu, J Peng, Z Zhang, H Song, Z Ding, MA Zhran, MA Eissa, AMS KheirCrop & Pasture Science, 2020•connectsci.Au*. https://connectsci.au/cp/article-abstract/71/12/1010/91893
20. Volodina, E. N., Titova, V. I., & Kirillova, D. A. (2024). The influence of poultry manure on the yield and crop structure of spring rapeseed. *Agricultural Science Euro-North-East*, *25*(2), 216–226. https://doi.org/10.30766/2072-9081.2024.25.2.216-226

Cite this Article: Nabizada, M., Afghani, A.K. (2026). Effects of Varying Levels of Poultry Manure on Growth and Yield of Canola (Brassica napus L.) under Kabul Agro-climatic Conditions. International Journal of Current Science Research and Review, 9(7), pp. 4089-4095. DOI: https://doi.org/10.47191/ijcsrr/V9-i7-51