PSM
Biological Research

Research Article 2025 | Volume 10 | Issue 1 | 70-79

Effect of Sowing Date on Growth and Yield Performance of Sweet Melon (*Cucumis melo L.*) in Arid Field Conditions of Ghayathi, UAE

Imran Arshad[1]*, Phiji Jacob Philip[2], Mubarak Ahmed Saleh AlMansoori[3], Zaheer Ahmed Khan[4]

[1]Agriculture Engineer, Star Services LLC, Ghayathi Extension Center (ADAFSA Project), Ghayathi City, Abu Dhabi, United Arab Emirates.
[2]Agriculture Engineer, Star Services LLC, Madinat Zayed Extension Center (ADAFSA Project), Madinat Zayed City, Abu Dhabi, United Arab Emirates.
[3]AlDhafra Research Station Head, Department of Research and Development AlDhafra Region, Abu Dhabi Agriculture and Food Safety Authority (ADAFSA), Abu Dhabi, United Arab Emirates.
[4]Assistant Professor, Faculty of Agricultural Engineering and Technology, Department of Farm Structures and Postharvest Engineering, Sindh Agriculture University Tandojam, Sindh, Pakistan.

Abstract:
A field experiment was conducted in spring 2025 in Ghayathi, Al Dhafra region, Abu Dhabi, UAE, to evaluate the effect of sowing date on the growth and yield performance of sweet melon under arid open-field conditions. The study used a randomized complete block design (RCBD) with three replications, comparing three sowing dates: S_1 (15th February), S_2 (1st March), and S_3 (15th March). Statistically significant differences ($p < 0.05$) were observed among treatments, with S_2 showing statistically superior performance over S_1 and S_3 in all measured parameters. The highest vine length (174.2 cm), number of leaves (58.3), branches (88.4), leaf area (392.6 cm^2), flowers (18.6), nodes (11.8), fruits per plant (5.4), fruit weight (1.78 kg), and marketable yield (28.6 t/ha) were recorded in S_2. The superior performance of this sowing window is attributed to favorable climatic conditions during the early growth and reproductive phases. These results highlight the importance of sowing date as a critical agronomic factor influencing crop performance in desert environments. Based on the findings, sowing sweet melon around 1st March (S_2) is recommended to maximize productivity in Ghayathi and similar arid agroclimatic zones.

Open Access

Article Information

Received: July 28, 2025

Accepted: August 1, 2025

Published: August 3, 2025

Keywords
Sweet melon,
Sowing date,
Open-field cultivation,
Growth parameters,
Yield indicators,
Arid environment,
Ghayathi, UAE.

Authors' Contribution
IA designed the study; PJP performed the experiments, IA collected data, and wrote the first draft of the manuscript; MASA performed the statistical analysis; ZAK reviewed the draft of the manuscript; all authors approved manuscript for publication.

How to cite
Arshad, I., Philip, P.J., AlMansoori, M.A.S., Khan, Z.A., 2025. Effect of Sowing Date on Growth and Yield Performance of Sweet Melon (*Cucumis melo L.*) in Arid Field Conditions of Ghayathi, UAE. PSM Biol. Res., 10(1): 70-79.

***Correspondence**
Imran Arshad
Email:
engr_imran1985@yahoo.com

INTRODUCTION

Sweet melon (*Cucumis melo L.*) is a warm-season fruit crop renowned for its adaptability to arid and semi-arid climates, making it a strategic agricultural commodity in regions like Ghayathi, United Arab Emirates (Arshad, 2017). Its cultivation has gained importance due to its high market demand, both locally and internationally, driven by its appealing taste, extended shelf life, and rich nutritional profile including vitamin C, potassium, antioxidants, and dietary fiber (Akhter *et al*., 2020). These attributes not only support consumer health but also enhance its value in the fresh produce market (Zulkarami, *et al*., 2010). In the UAE, sweet melon plays a vital role in diversifying agricultural production and improving farm income, particularly for smallholder farmers operating in challenging desert environments (Arshad *et al*., 2015). The crop's resilience to heat and drought, coupled with advancements in irrigation technologies such as drip systems and fertigation, has enabled its successful expansion across marginal lands (Ejaz *et al*., 2021).

Despite progress in cultivar selection and water management, the timing of sowing remains a critical yet under researched factor influencing crop performance (Gola *et al*., 2024). Sowing date directly affects phenological development, vegetative growth, flowering, fruit set, and ultimately yield, due to variations in temperature, relative humidity, and solar radiation throughout the growing season (Khan *et al*., 2018). In arid zones like Ghayathi, where climatic extremes can rapidly shift, identifying the optimal planting window is essential for maximizing productivity and resource use efficiency (Arshad *et al*., 2023).

This study aims to evaluate the impact of three distinct sowing dates on the growth dynamics and yield outcomes of sweet melon under Ghayathi's unique agro-climatic conditions. By analyzing growth parameters, fruit quality, and yield metrics across different planting schedules, the research seeks to provide actionable insights for growers and agricultural planners. The goal is to establish scientifically supported recommendations that enhance crop performance, reduce production risks, and support sustainable melon farming in the UAE.

MATERIALS AND METHODS

Study area and climate

The field experiment was conducted during the spring season of 2025 at a private experimental site located in Ghayathi, Al Dhafra region, Abu Dhabi, UAE (23.752843°N, 52.882499°E). This region experiences a typical hot desert climate characterized by extremely low annual rainfall (less than 100 mm), intense solar radiation, and sandy soils with poor organic matter content.

Experimental design

The field experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications to assess the effect of sowing date on the growth and yield performance of sweet melon under arid conditions. Three sowing date treatments were applied: S_1 (15th February), S_2 (1st March), and S_3 (15th March). The experiment began with pre-sowing operations on 1st February 2025 and concluded with the final harvest on 15th June 2025, spanning a crop cycle of approximately 120 days (Parajuli and Dhital, 2023). Each plot measured 3 × 3 meters, with planting spots spaced at 50 × 50 cm to maintain uniform plant density. Three seeds were sown per spot and later thinned to one healthy seedling per location. A drip irrigation system with 4 L/h emitters was installed and tested before planting. Daily irrigation was applied based on crop water requirements to ensure optimal moisture conditions throughout the growing period (Abaza *et al*., 2023).

Nutrient management involved a basal dose of water-soluble NPK (20:20:20) fertilizer delivered through fertigation at 5-day intervals, totaling 120 kg/ha per season. The fertilizer was evenly distributed across vegetative, flowering, and fruiting stages. Additionally, calcium and magnesium were applied biweekly as foliar sprays to address specific micronutrient deficiencies identified in pre-sowing soil tests. To maintain a pest and disease-free crop, Integrated Pest Management (IPM) practices were implemented (Pujar *et al*., 2024). Preventive applications of neem oil (2%) and *Bacillus thuringiensis* helped control chewing pests and caterpillars, while sticky yellow traps were used to monitor whiteflies and aphids. Copper oxychloride was sprayed every 15 days to protect against fungal diseases, especially during flowering and fruit setting stages.

Soil sampling and analysis

Before the sowing of treatments, composite soil samples were collected from the 0–20 cm topsoil layer of the field and analyzed in the laboratory using standard protocols. The parameters measured included soil pH, electrical conductivity (EC), organic matter content, and available concentrations of nitrogen (N), phosphorus (P), and potassium (K).

Data collection

Growth data were collected periodically throughout the crop cycle to assess plant development under different sowing dates. The parameters recorded included vine length, number of leaves, number of branches, leaf area, number of flowers, and number of nodes per plant. At the time of harvest, yield-related parameters such as the number of fruits per plant, average fruit weight, and total marketable yield per plot were measured to evaluate the influence of sowing time on reproductive performance and final productivity.

Statistical analysis

All collected data were statistically analyzed using Analysis of Variance (ANOVA) at a 5% level of significance ($p \leq 0.05$) to evaluate the impact of different sowing dates on the growth and yield attributes of sweet melon. The analysis was performed using GenStat 22nd Edition statistical software. Where ANOVA indicated significant differences among treatments, mean separation was conducted using the Least Significant Difference (LSD) test to identify the most effective sowing window.

RESULTS AND DISCUSSION

The findings of this study clearly demonstrate that sowing date exerts a significant influence on the vegetative and reproductive performance of sweet melon under arid climatic conditions. Environmental variables such as temperature, solar radiation, and relative humidity varied across the three sowing windows, resulting in measurable differences in growth parameters and yield components. The results of the analysis indicated that the experimental soil was slightly alkaline, moderately saline, and nutrient-deficient, typical of sandy soils in desert environments, and helped inform the fertilization strategy adopted for the trial (Table 1). Among the treatments, sowing on 1st March (S_2) consistently yielded superior outcomes, underscoring the importance of aligning sowing schedules with favorable agro-climatic conditions to optimize crop productivity. The results presented in Table (2) reveal that sowing date significantly influenced the vegetative and reproductive performance of sweet melon under arid conditions.

Effect on Vine Length

Vine length was significantly affected by sowing date, with the longest vines observed in S_2 (174.2 cm), followed by S_1 (168.7 cm) and S_3 (159.4 cm). The enhanced elongation in S_2 is attributed to moderate temperatures and optimal solar radiation during the early vegetative phase, which facilitated vigorous root development and efficient nutrient uptake. These conditions promote cell division and elongation, contributing to increased vine growth. In contrast, the elevated temperatures during the S_3 sowing period likely induced thermal stress, inhibiting elongation, and reducing overall vegetative vigor. This observation aligns with Adeyeye et al.

(2017), who emphasized the role of environmental synchronization in maximizing vine development for sweet melon. As illustrated in Figure 1, the S_2 sowing date resulted in the greatest vine length, highlighting its favorable effect on early vegetative development.

Table 1. Physicochemical characteristics of sandy soil at the experimental field, Ghayathi, Al Dhafra Region, UAE (Spring 2025).

Parameter	**Value**	**Unit**	**Remarks**
Soil pH	7.6	-	Slightly alkaline
Electrical Conductivity (EC)	4.25	dS/m	Moderate salinity
Organic Carbon	0.09	%	Extremely low
Organic Matter	0.15	%	Deficient
Total Nitrogen (N)	0.02	%	Deficient
Available Phosphorus (P)	2.8	mg/kg	Deficient
Exchangeable Potassium (K)	55	mg/kg	Deficient
Exchangeable Calcium (Ca)	320	mg/kg	Low moderate
Exchangeable Magnesium (Mg)	75	mg/kg	Low
Exchangeable Sodium (Na)	115	mg/kg	Moderately high
Cation Exchange Capacity (CEC)	6.2	meq/100g	Very low
Base Saturation	72	%	Sub-optimal
Sand Content	87	%	Dominant particle size
Silt Content	7.5	%	low
Clay Content	5.5	%	Very Low
Textural Class	Sandy	-	USDA soil classification

Table 2. Influence of sowing date on morphological growth and yield parameters of Sweet Melon (*Cucumis melo L.*) under open field conditions.

Treatment	**Vine Length (cm)**	**Number of Leaves**	**Number of Branches**	**Leaf Area (cm²)**	**Number of Flowers**	**Number of Nodes**	**Fruits per Plant**	**Average Fruit Weight (kg)**	**Marketable Yield (t/ha)**
S1 (15 Feb)	168.7	52.7	82.6	368.2	15.4	10.9	4.7	1.62	24.7
S2 (1 Mar)	174.2	58.3	88.4	392.6	18.6	11.8	5.4	1.78	28.6
S3 (15 Mar)	159.4	49.1	76.2	354.8	13.8	9.6	4.1	1.49	20.4
LSD (5%)	5.21	3.94	4.16	15.7	2.11	1	0.64	0.13	1.84

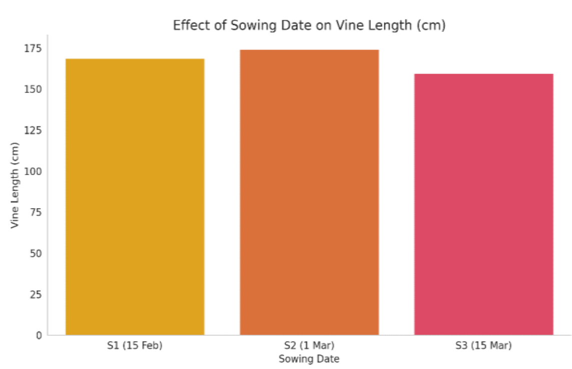

Fig. 1. Comparison of vine length of sweet melon as affected by sowing date under open-field conditions.

Effect on number of leaves

Leaf production was highest in S_2 (58.3 leaves/plant), followed by S_1 (52.7) and S_3 (49.1). Leaf formation is closely linked to photosynthetic activity, which is influenced by light intensity and temperature. The moderate climatic conditions during early March likely enhanced chlorophyll synthesis and stomatal conductance, promoting leaf expansion and biomass accumulation. A higher leaf count contributes to a larger photosynthetic surface area, which is essential for energy capture and carbohydrate synthesis. Widaryanto et al. (2017) similarly reported that optimal sowing dates, combined with adequate irrigation and fertilization, significantly improve leaf development and overall plant vigor. Figure 2 clearly demonstrates that S_2 produced the highest number of leaves per plant, confirming the enhanced canopy development under optimal sowing conditions.

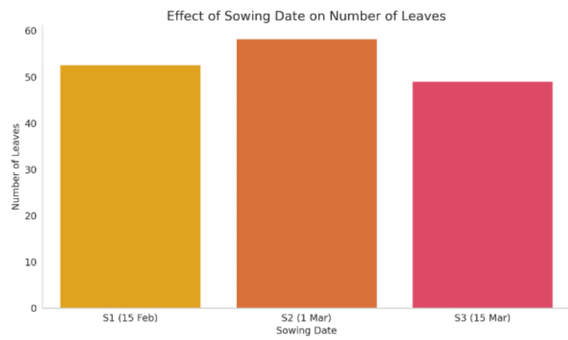

Fig. 2. Comparison of number of leaves per plant of sweet melon as affected by sowing date under open-field conditions.

Effect on number of branches

Branching was most productive in S_2 (88.4 branches/plant), followed by S_1 (82.6) and S_3 (76.2). Branch formation is a key indicator of vegetative robustness and is influenced by hormonal balance and environmental cues such as photoperiod and temperature. The favorable conditions during S_2 likely promoted auxin redistribution and lateral bud activation, resulting in increased branching. In contrast, the high evaporative demand during S_3 may have suppressed lateral growth due to water stress and reduced turgor pressure. Walters et al. (2021) reported similar findings, highlighting the sensitivity of branching to early season environmental stress and its impact on canopy architecture. As shown in Figure 3, S_2 led to a significant increase in branching, reflecting better hormonal balance and environmental compatibility.

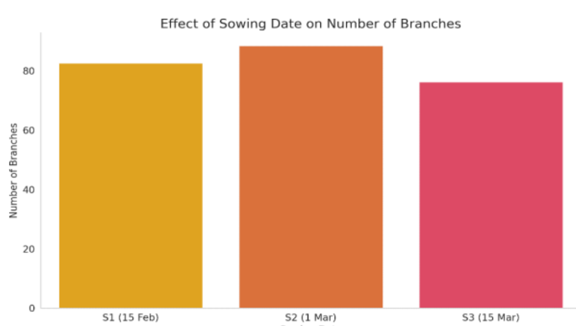

Fig. 3. Comparison of number of branches per plant of sweet melon as affected by sowing date under open-field conditions.

Effect on leaf area

Maximum leaf area was recorded in S_2 (392.6 cm²), with S_1 and S_3 yielding 368.2 cm² and 354.8 cm², respectively. Leaf area is a critical determinant of photosynthetic capacity and is influenced by both thermal and hydric conditions. The optimal temperature and moisture availability during S_2 likely facilitated cell expansion and delayed senescence, resulting in larger leaf surfaces. Reduced leaf area in S_3 may be attributed to accelerated aging and reduced turgidity under heat stress. Aluko (2020) emphasized that early season vigor, supported by appropriate sowing dates and irrigation is essential for maximizing leaf area and enhancing canopy efficiency. Figure 4 presents the superior leaf area observed in S_2, validating the influence of timely sowing on photosynthetic surface expansion.

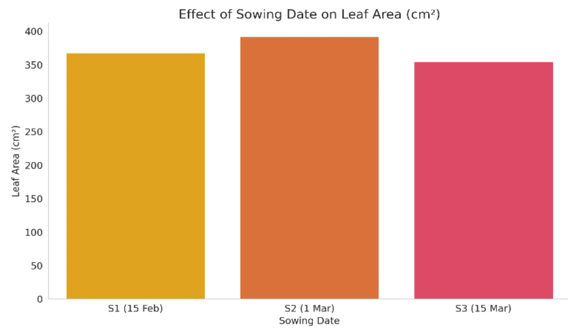

Fig. 4. Comparison of leaf area of sweet melon as affected by sowing date under open-field conditions.

Effect on number of flowers

Flower production was significantly higher in S_2 (18.6 flowers/plant), compared to S_1 (15.4) and S_3 (13.8). Floral initiation is highly sensitive to temperature and photoperiod, and the timing of S_2 sowing coincided with optimal conditions for reproductive development. Enhanced flowering in S_2 may also be linked to improved carbohydrate availability and hormonal regulation, particularly gibberellins and cytokinins. Successful pollination and fruit set are contingent upon synchronized flowering and favorable environmental conditions. Quddoos et al. (2025) noted that reproductive success is maximized when flowering aligns with optimal climatic windows. As depicted in Figure 5, the highest flower production occurred in S_2, suggesting better synchronization with reproductive phase conditions.

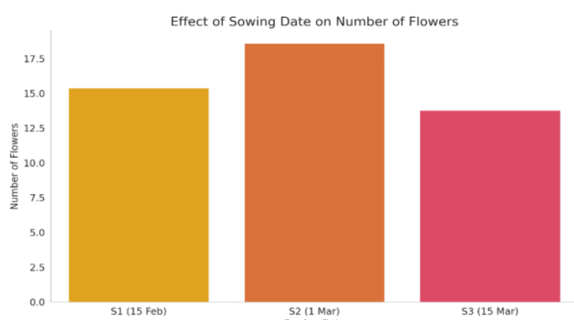

Fig. 5. Comparison of number of flowers per plant of sweet melon as affected by sowing date under open-field conditions.

Effect on number of nodes

Node development followed a similar trend, with S_2 producing the highest number of nodes per plant (11.8), followed by S_1 (10.9) and S_3 (9.6). Node formation is influenced by internodal elongation, which is regulated by temperature, nutrient availability, and hormonal activity. The favorable conditions during S_2 likely promoted meristematic activity and cell division, resulting in increased node formation. Arar and Kuşçu, (2022) reported that optimal sowing dates enhance node development, which is crucial for supporting leaf and branch formation and ultimately influencing fruit-bearing potential. Figure 6 illustrates the maximum node development in S_2, further supporting the role of sowing date in structural growth enhancement.

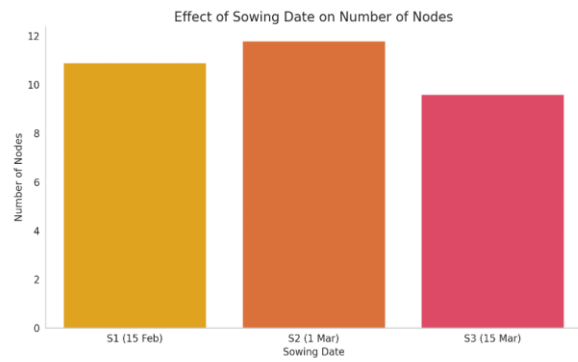

Fig. 6. Comparison of number of nodes per plant of sweet melon as affected by sowing date under open-field conditions.

Effect on fruit number per plant

Fruit set was significantly higher in S_2 (5.4 fruits/plant), followed by S_1 (4.7) and S_3 (4.1). The superior fruiting in S_2 is attributed to optimal synchronization between flowering and pollinator activity, as well as favorable conditions for ovule fertilization and fruit development. Environmental stress during the reproductive phase, particularly heat stress in S_3, can impair pollen viability and reduce fruit set. Maluki et al. (2023) emphasized that reproductive success and fruit number are strongly influenced by sowing date and associated climatic conditions. As evident in figure 7, the highest fruit number per plant was achieved in S_2, emphasizing its favorable impact on fruit set.

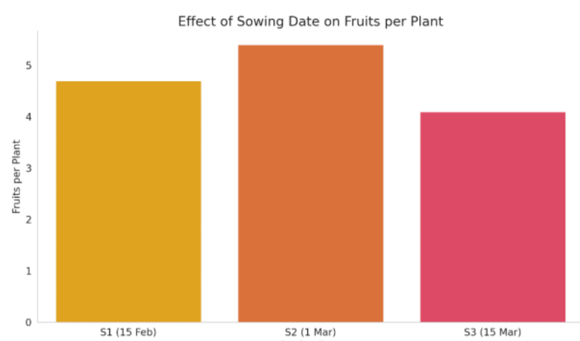

Fig. 7. Comparison of number of fruits per plant of sweet melon as affected by sowing date under open-field conditions.

Effect on fruit weight

Average fruit weight was highest in S_2 (1.78 kg), followed by S_1 (1.62 kg) and S_3 (1.49 kg). Fruit weight is a function of assimilate partitioning and duration of fruit filling, both of which are influenced by temperature and water availability. The optimal conditions during S_2 likely supported sustained photosynthesis and carbohydrate translocation to developing fruits. In contrast, heat stress during S_3 may have shortened the fruit filling period and reduced assimilate accumulation. Mohamed et al. (2022) reported that balanced vegetative and reproductive growth, facilitated by appropriate sowing dates, is essential for achieving optimal fruit size. Figure 8 confirms that average fruit weight peaked under S_2, indicating improved assimilate partitioning and fruit development.

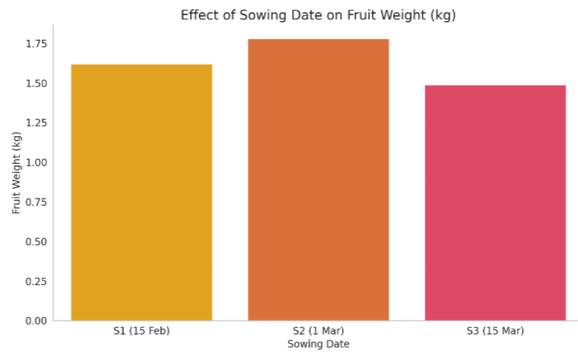

Fig. 8. Comparison of average fruit weight of sweet melon as affected by sowing date under open-field conditions.

Effect on Marketable Yield

Marketable yield was highest in S_2 (28.6 tons/ha), followed by S_1 (24.7 tons/ha) and S_3 (20.4 tons/ha). The superior yield performance in S2 reflects a harmonious balance between vegetative vigor and reproductive efficiency under favorable climatic conditions. Yield is a cumulative outcome of multiple growth parameters, including vine length, leaf area, flower and fruit number, and fruit weight. These results reinforce the strategic importance of sowing date selection in maximizing productivity in arid environments. Sabo et al. (2013) and Susila et al. (2012) similarly concluded that optimal sowing dates, combined with appropriate agronomic practices, significantly enhance marketable yield in sweet melon. As shown in Figure 9, S_2 significantly outperformed other sowing dates in marketable yield, demonstrating its superiority for maximizing productivity.

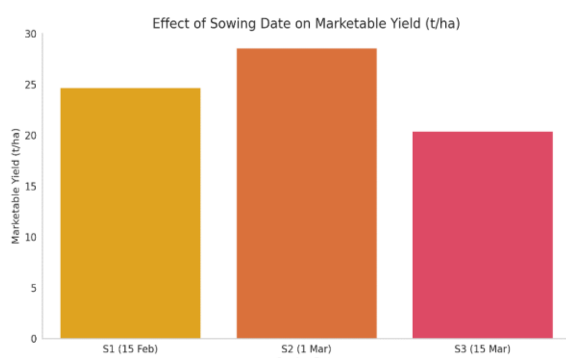

Fig. 9. Comparison of marketable yield of sweet melon as affected by sowing date under open-field conditions.

CONCLUSION

Sowing date exerted a highly significant effect on sweet melon performance under arid open field conditions. Optimal results were achieved with early March sowing (S_2), which aligned with favorable temperature and light conditions, enhancing vegetative growth, flowering, fruit development, and overall yield. Conversely, late sowing S_3 exposed plants to excessive temperatures during flowering and fruit filling, markedly reducing all yield components. Therefore, farmers in Ghayathi and similar desert agro-ecosystems should align land preparation, drip irrigation scheduling, and seedling establishment with the S_2 sowing period to optimize yield and improve resource efficiency.

CONFLICT OF INTEREST

Authors hereby declare that they have no conflict of interest.

REFERENCES

Abaza, A.S.D., Elshamly, A.M.S., Alwahibi, M.S., 2023. Impact of different sowing dates and irrigation levels on NPK absorption, yield and water use efficiency of maize. Sci. Rep., 13: 12956. https://doi.org/10.1038/s41598-023-40032-9

Adeyeye, A., Akanbi, W., Olalekan, K., Lamidi, W., Othman, H., Ishaku, M., 2017. The growth and yield performance of sweet melon as affected by planting spacing in Northeast Nigeria. Int. Res. J. Agric. For., 4(8): 17–21.

Akhter, M., Shahid, M.A., Nayyar, Z.A., 2020. Muskmelon production under different sowing dates and nitrogen levels in arid conditions. J. Hort. Res., 28(3): 115–124.

Aluko, M., 2020. Sowing Dates and Fertilizer Application on Growth and Yield of Muskmelon (*Cucumis Melo L.*) at Ado-Ekiti. Asian J. of Agric. Hort. Res., 5(3): 1–21. https://doi.org/10.9734/ajahr/2020/v5i330052.

Arar, H. Kuşçu, H., 2025. Effects of different levels of irrigation and nitrogen interactions on yield and water productivity in watermelon irrigated by drip method. Bursa Uludag Üniv. Ziraat Fak. Derg., 39(1): 55-70. https://doi.org/10.20479/bursauludagziraat.1574975

Arshad, I., Khan, Z.A., Ali, W., 2023. Impact of vocational agricultural training programs on the promotion of alfalfa cultivation in Ghayathi, United Arab Emirates. PSM Biol. Res., 8(1): 31–35.

Arshad, I., 2017. Effect of different levels of water soluble NPK (20-20-20) fertilizer on the growth and yield of white radish (*Raphanus sativus L.*). PSM Biol. Res., 2(2): 74–78.

Arshad, I., Khan, Z.A., Babar, M.M., Sarki, A., 2015. Effect of different levels of water soluble NPK (20-20-20) fertilizers on the growth and yield of carrot (*Daucus carota L.*) using drip irrigation technology. Int. J. Res. App. Sci. Eng. Tech., 3(5): 708-714.

Ejaz, A., Ghulam, N., Muhammad, I., Zulfiqar, A., Muhammad, Y.A., Asad, A.K., 2021. Effect of sowing times on the growth, yield and quality of muskmelon (*Cucumis melo L.*) varieties. Fresenius Environ. Bull., 30(4): 3408–3412.

Gola, S.K., Kumar, S., Kumar, N., Singh, U., Kumar, S., 2024. Effect of Date of Sowing and Plant Growth Regulators in Snap Melon (*Cucumis melo L.*) var. momordica Roxb. Biological Forum – Int. J., 16(12): 18-23.

Khan, M.I., Iqbal, M., Aslam, M., 2018. Growth and yield of melon as affected by different sowing dates under semi-arid conditions. Pak. J. Agric. Res., 31(2): 130–135.

Maluki, M.M., Ahmed, A.M., Musa, H.O., 2023. Evaluation of transplanting and direct seeding methods on growth and yield of sweet melon under desert conditions. Sudan J. Agric. Res., 22(1): 1–10.

Mohamed, E.A., Abdel-Nasser, G., Mona, M.Y., 2022. Yield and quality performance of some new sweet melon lines under water stress conditions. J. Adv. Agric. Res., 27(1): 148–161.

Parajuli, S., Dhital, P.R., 2023. Effect of plant spacing and sowing dates on the growth and yield of radish (*Raphanus sativus*) in Rupandehi district, Nepal. Archives Agric. Environ. Sci., 8(4): 579-584. https://dx.doi.org/10.26832/24566632.2023.0804018

Pujar, K., Archana B.R., Chethan T., Shudeer, A., Chaitanya, M., Varma H.M., 2024. Effectiveness of various insecticides against key watermelon pests: A field study in Karnataka. Int. J. Adv. Biochem. Res., 8(9): 143-147. DOI: 10.33545/26174693.2024.v8.i9Sb.2075

Quddoos, A., Mahmood, K., Ali, M., Farooq, M., Khan, A., Khan, N., Ullah, B., 2025. Impact of different sowing dates on yield and agronomic traits of wheat under arid and semi-arid conditions of Bannu Division. Pure and Applied Biology., 14(2): 599-606. http://dx.doi.org/10.19045/bspab.2025.140057

Sabo, M.U., Wailare, M.A., Aliyu, M., Jari, S., Shuaibu, Y.M., 2013. Effect of NPK fertilizer and spacing on growth and yield of watermelon (*Citrullus lanatus L.*) in Kaltungo Local Government Area of Gombe State, Nigeria. Scholarly J. Agric. Sci., 3(8): 325–330.

Susila, T., Reddy, S.A., Rajkumar, M., Padmaja, G., Rao, P.V., 2012. Effects of sowing date and spraying of brassinosteroid on yield and fruit quality characters of watermelon. World J. Agric. Sci., 8(3): 223–228.

Walters, S.A., Abdelaziz, M., Bouharroud, R., 2021. Local Melon and Watermelon Crop Populations to Moderate Yield Responses to Climate Change in North Africa. Climate, 9(8): 129. https://doi.org/10.3390/cli9080129

Widaryanto, E., Wicaksono, K.P., Najiyah, H., 2017. Drought effect simulation on the growth and yield quality of melon (*Cucumis melo L.*). J. Agron., 16(4): 147–153.

Zulkarami, B., Ashrafuzzaman, M., Razi, M.I., 2010. Morpho-physiological growth, yield and fruit quality of rock melon as affected by growing media and electrical conductivity. J. Food. Agric. Environ., 8(1): 249–252.