Science Discovery Agriculture
2026, Vol. 1, No. 3, pp. 138–144
https://doi.org/10.11648/j.sda.20260103.12

SciencePG
Science Publishing Group

Research Article

Coriander (*Coriandrum sativum* L.) Varieties Adaptation Trial in Kellem Wollega Zone of Western Oromia

Alemayehu Latera*, Kibiru Kena, Ashenafi Debela

Haro Sabu Agricultural Research Center, Oromia Agricultural Research Institute, Dambi Dollo, Ethiopia

Abstract

In Ethiopia, coriander is an important spice crop cultivated for household consumption and income generation, but productivity in many areas is constrained by limited access to well-adapted varieties, disease pressure, and variable growing conditions. This study evaluated five improved coriander varieties (Derara, Gadisa, Batu, Tulu, and Walta-I) together with a local cultivar to identify adapted and high-yielding materials for the midland agro-ecologies of Kellem Wollega Zone, western Oromia. The trial was conducted at Belem, Gute Aneni, and Hewa Gelan during the 2025 cropping season using a randomized complete block design with three replications. Data were collected on phenology, growth, yield and yield components, and disease reaction. Combined analysis of variance showed highly significant differences among varieties for most agronomic and yield-related traits, while location effects were significant for several traits. The variety × location interaction was not significant for most traits, except days to maturity and total seed yield, indicating relatively consistent performance across the test locations for many characters. The local check produced the highest mean total seed yield (1,124.67 kg ha^{-1}), followed by Batu (283.83 kg ha^{-1}), whereas Derara (157.82 kg ha^{-1}) and Walta-I (169.75 kg ha^{-1}) produced the lowest yields. The local check also showed superior performance for several growth traits and relatively low disease scores. The results demonstrate the value of locally adapted coriander cultivar and support further evaluation, farmer-participatory testing, and characterization of local materials for future coriander variety improvement in Kellem Wollega Zone.

Keywords

Coriander, Adaptation, Local Cultivar, Seed Yield, variety × location interaction

1. Introduction

Coriander (Coriandrum sativum L.; 2n = 2x = 22) is a diploid annual species of the family Apiaceae. The crop is considered to have originated in the Mediterranean region and is now cultivated widely in Europe, Asia, the Americas, and other regions [1, 2]. Coriander is grown for both its leaves and fruits, with the dried fruits commonly used as a spice and the plant also valued for its essential oils and other bioactive compounds [1, 3].

In Ethiopia, coriander is cultivated in a range of agro-ecologies and is important for household consumption and income generation. The crop is used as a culinary spice and in traditional and industrial applications. Coriander essential oils and volatile compounds have also been reported to possess antimicrobial activity [4, 5]. Yield performance is affected by genetic background, environmental conditions, sowing time, and agronomic management [3, 6]. Previous multi-environment

*Correspondence: Alemayehu Latera (ealemayehulatera987@gmail.com)

Received: 25 September 2026; **Accepted:** 8 October 2026; **Published:** 29 October 2026

Copyright: © The Author(s), 2026. Published by Science Publishing Group. This is an **Open Access** article, distributed under the terms of the Creative Commons Attribution 4.0 License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

studies have demonstrated substantial differences among coriander genotypes for flowering, maturity, plant height, seed yield, and stability across environments [2, 6].

Kellem Wollega Zone is an important coriander-producing area of western Oromia. However, limited availability of well-adapted improved varieties, disease pressure, agronomic constraints, and marketing challenges can restrict production and productivity. Recent Ethiopian studies continue to show that coriander varieties differ substantially in yield and response to management and environments, emphasizing the need for location-specific variety evaluation [9, 10, 11]. Therefore, evaluating released varieties together with local material is important for identifying suitable cultivars and for determining whether locally adapted cultivar may provide useful material for future breeding.

The objective of this study was to evaluate the adaptation, agronomic performance, seed yield, and disease reaction of selected coriander varieties and a local cultivar in the midland agro-ecologies of Kellem Wollega Zone, western Oromia.

2. Materials and Methods

2.1. Study Area

The trial was conducted during the 2025 cropping season at three locations in Kellem Wollega Zone of western Oromia: Belem, Gute Aneni, and Hewa Gelan. The trial was facilitated by Haro Sabu Agricultural Research Center. These locations represent the target midland agro-ecology for which the tested varieties were being evaluated.

2.2. Experimental Materials

Five improved coriander varieties were obtained from Sinana Agricultural Research Center and evaluated together with a farmer-maintained local cultivar. The varieties, year of release, and maintaining institution reported in the original experimental record are presented in Table 1.

Table 1. *Description of coriander planting materials used in the adaptation trial.*

Variety	Year of release	Maintainer
Derara	2021	Sinana ARC/OARI
Gadisa	2019	Sinana ARC/OARI
Batu	2018	Adami Tulu ARC/OARI
Tulu	2018	Adami Tulu ARC/OARI
Walta-I	2006	Sinana ARC/OARI
Local	—	Farmer

Source: Ministry of Agriculture Crop Variety Registration Bulletin (1983–2023).

2.3. Experimental Design and Crop Management

The experiment was laid out in a randomized complete block design (RCBD) with three replications at each location. Rows were spaced 30 cm apart and the gross plot size was 3.0 m × 1.5 m (4.5 m²). Fertilizer was applied at 100 kg ha^{-1} NPS and 100 kg ha^{-1} urea, and the seed rate was 12 kg ha^{-1}. Other agronomic practices followed the crop recommendations reported by the Ministry of Agriculture and Natural Resources [12].

2.4. Data Collection

Data were collected from the three middle rows of each plot after excluding border rows. The recorded traits were days to 50% flowering (DF), days to 90% maturity (DM), plant height (PH, cm), canopy length (CL, cm), number of primary branches per plant (NPrBPP), number of seeds per plant (NSPP), thousand-seed weight (TSW, g), total seed yield (TSY, kg ha^{-1}), and disease reaction. The diseases assessed were bacterial blight (BB), Cercospora leaf spot (CLS), root rot (RR), stem rot (SR), and Fusarium wilt (FW).

2.5. Statistical Analysis

Combined data across locations were analyzed using R software. Analysis of variance was used to test the effects of variety, location, and variety × location interaction. Mean separation was conducted using the least significant difference (LSD) test at the 5% probability level following the general procedures described by Gomez and Gomez [7]. GGE biplot analysis was used to visualize the relationship between mean seed yield and stability of the tested varieties across locations, following the genotype plus genotype × environment framework described by Yan et al. [8].

3. Results

3.1. Analysis of Variance

Combined analysis of variance (ANOVA) showed highly significant differences ($P < 0.01$) among varieties for all measured agronomic traits except Cercospora leaf spot. Location effects were significant for several traits, while the variety × location interaction was significant for days to maturity and total seed yield but not for most other traits (Table 2). This indicates substantial varietal differences and, for many traits, relatively consistent varietal responses across the three test locations.

Table 2. Combined analysis of variance for coriander varieties evaluated across three locations.

Source	df	DF	DM	PH	CL	NPrBPP	NSPP	TSW	TSY	BB	CLS	RR	SR	FW
Variety	5	105.56**	302.56**	1513.56**	230.72**	6.65**	58410.90**	6.69**	1272429.04**	22.95**	1.24 ns	8.92**	7.20**	6.24**
Replication	2	0.72 ns	13.46 ns	18.92 ns	84.25 ns	0.34 ns	4801.28 ns	0.91 ns	28207.06 ns	0.13 ns	0.89 ns	0.80 ns	0.39 ns	0.91 ns
Location	2	12.06 ns	465.35**	1860.43**	14.39 ns	0.32 ns	3407.92 ns	6.97**	60684.29*	6.91*	6.22**	16.07**	29.56**	3.13 ns
Variety × Location	10	7.61 ns	10.64*	70.62 ns	16.87 ns	0.57 ns	3660.57 ns	2.06 ns	61518.27**	2.73 ns	1.07 ns	1.32 ns	1.29 ns	0.91 ns
Residual	34	4.41	4.27	61.08	20.26	0.31	2704.8	1.13	13659.0	1.76	0.89	1.38	1.51	1.04
CV (%)		3.4	1.86	12.24	20.96	23.94	53.28	12.19	32.22	34.11	49.9	49.6	61.37	82.4

Note: DF = days to 50% flowering; DM = days to 90% maturity; PH = plant height; CL = canopy length; NPrBPP = number of primary branches per plant; NSPP = number of seeds per plant; TSW = thousand-seed weight; TSY = total seed yield; BB = bacterial blight; CLS = Cercospora leaf spot; RR = root rot; SR = stem rot; FW = Fusarium wilt. * $P < 0.05$; ** $P < 0.01$; ns = not significant.

3.2. Phenology and Growth Traits

Variety had a highly significant effect ($P < 0.01$) on days to flowering, days to maturity, plant height, canopy length, and number of primary branches per plant. Location significantly affected days to maturity and plant height, whereas the variety × location interaction was not significant for these traits except days to maturity.

Across locations, days to 50% flowering ranged from 58.00 to 67.78 days and days to 90% maturity from 106.33 to 120.89 days. The local check was the latest to flower and mature, while Walta-I was the earliest for both traits. Plant height ranged from 48.14 to 82.29 cm, canopy length from 15.33 to 30.58 cm, and number of primary branches per plant from 1.43 to 3.91. The local check had the highest values for plant height, canopy length, and primary branches, whereas Derara had the lowest values for these traits (Table 3).

Table 3. Combined means of phenology and growth traits of coriander varieties.

Variety	DF (days)	DM (days)	PH (cm)	CL (cm)	NPrBPP
Tulu	60.89 bc	108.22 cd	70.91 b	21.44 b	2.38 b
Local check	67.78 a	120.89 a	82.29 a	30.58 a	3.91 a
Gadisa	62.78 b	109.22 c	62.20 c	19.41 bc	2.16 bc
Batu	62.00 b	115.11 b	68.96 bc	22.24 b	2.41 b
Walta-I	58.00 d	106.33 d	50.60 d	19.85 b	1.74 cd
Derara	59.22 cd	106.44 d	48.14 d	15.33 c	1.43 d
Grand mean	62.00	111.04	63.85	21.48	2.34
LSD (0.05)	2.00	1.98	7.49	4.31	0.54

Variety	DF (days)	DM (days)	PH (cm)	CL (cm)	NPrBPP
CV (%)	3.40	1.86	12.24	20.96	23.94

Means followed by the same letter are not significantly different at P = 0.05.

3.3. Yield and Yield Components

Variety significantly affected number of seeds per plant, thousand-seed weight, and total seed yield ($P < 0.01$). Location significantly affected thousand-seed weight and total seed yield, while the variety × location interaction was significant only for total seed yield. The local check had the highest number of seeds per plant (252.67) and the highest total seed yield (1,124.67 kg ha^{-1}). Tulu had the highest thousand-seed weight (9.78 g), followed by the local check (9.11 g). Derara and Walta-I had the lowest total seed yields, 157.82 and 169.75 kg ha^{-1}, respectively (Table 4).

Table 4. Combined means of seed yield and yield components of coriander varieties.

Variety	NSPP	TSW (g)	TSY (kg ha^{-1})
Tulu	88.15 b	9.78 a	231.40 bc
Local check	252.67 a	9.11 abc	1124.67 a
Gadisa	77.10 b	8.48 bc	208.93 bc
Batu	94.56 b	9.33 ab	283.83 b
Walta-I	51.38 bc	7.42 d	169.75 c
Derara	21.78 c	8.16 cd	157.82 c
Grand mean	97.61	8.71	362.73
LSD (0.05)	49.82	1.02	111.96
CV (%)	53.28	12.19	32.22

3.4. Disease Reaction

Variety and location effects were significant for most disease scores, whereas the variety × location interaction was not significant for the disease traits. The assessed diseases were bacterial blight, Cercospora leaf spot, root rot, stem rot, and Fusarium wilt. Lower disease scores were generally observed for the local check and Tulu than for several of the improved varieties (Table 5). Because the original dataset does not state the disease-rating scale in the methods, the scores are reported as recorded and should be accompanied by the exact rating scale before final submission.

Table 5. Combined mean disease-reaction scores of coriander varieties.

Variety	BB	CLS	RR	SR	FW
Tulu	3.11 c	1.67	2.00 b	1.89 bc	0.78 cd
Local check	1.44 d	1.44	0.67 c	0.89 c	0.00 d
Gadisa	5.22 ab	1.89	3.22 a	2.56 ab	1.44 abc
Batu	3.44 c	1.67	2.33 ab	1.44 bc	1.00 bc
Walta-I	4.33 bc	2.33	2.56 ab	1.78 bc	1.89 ab
Derara	5.89 a	2.33	3.44 a	3.44 a	2.33 a

Variety	BB	CLS	RR	SR	FW
Grand mean	3.91	1.89	2.37	2.00	1.24
LSD (0.05)	1.28	NS	1.13	1.18	0.98
CV (%)	34.11	49.90	49.64	61.40	82.38

Lower values indicate lower disease scores; the exact rating scale should be stated in the final Methods section.

4. Discussion

The significant varietal differences observed for phenology, growth, yield components, and seed yield indicate substantial genetic variation among the tested coriander materials. Such variation is expected in coriander because genotypes differ in growth habit, maturity, yield potential, and adaptation to environmental conditions. Previous coriander evaluation studies have similarly reported significant differences among genotypes for flowering, maturity, plant height, seed yield, and stability [2, 6].

The relatively limited variety × location interaction for most traits suggests that many varietal differences were expressed consistently across Belem, Gute Aneni, and Hewa Gelan. However, the significant interaction for days to maturity and total seed yield shows that environmental conditions influenced maturity and yield responses. Environmental effects on coriander yield are well documented, including effects of temperature, precipitation, sowing time, and agronomic management [3]. The current result is also consistent with recent Ethiopian studies showing that coriander varieties respond differently to production environments and management levels [9, 11].

The superior performance of the local check for seed yield was the most important finding of the study. Its mean yield of 1,124.67 kg ha^{-1} was substantially higher than the tested improved varieties. The local check also had the greatest plant height, canopy length, number of primary branches, and number of seeds per plant. This combination of traits may partly explain its high seed yield, although a formal correlation or path analysis was not conducted in this study. Recent work in Ethiopia has likewise demonstrated large differences among coriander varieties in seed yield and yield components, including strong responses to fertilizer management [9, 11].

The performance of the local check is particularly relevant for breeding and variety development. Local cultivars can contain locally adapted alleles and may perform well under production conditions that differ from those of the environments in which formal varieties were selected. The current result therefore supports systematic collection, characterization, conservation, and multi-environment evaluation of coriander landraces from Kellem Wollega.

The GGE biplot placed the local check closest to the ideal variety, supporting the conclusion that it combined relatively high yield with stable performance across the tested environments. GGE biplot analysis is designed to evaluate genotype main effects together with genotype × environment interaction and is useful for interpreting multi-environment trials [8]. However, the present experiment covered only three locations in one season. Therefore, the observed stability should be interpreted as stability across the three tested environments in 2025 rather than broad, long-term stability.

Regarding disease reaction, the local check and Tulu generally had lower disease scores than several improved varieties. Because the original experiment did not specify the disease-rating scale or the pathogen-identification procedures, these results should be interpreted as relative field disease scores rather than confirmed resistance. Future studies should define the rating scale, assess disease incidence and severity separately, and, where possible, confirm the causal pathogens.

Recent coriander research also demonstrates continuing progress in variety development in Ethiopia. A newly released variety, Hawata, was reported to have performed well across several environments in Bale midlands [10], while a 2026 study in western Ethiopia reported strong variety × fertilizer interactions for coriander growth and yield [11]. These findings reinforce the need to evaluate varieties under the specific environmental and management conditions of each target production area.

5. Conclusion

The coriander varieties differed significantly for most phenological, growth, yield, and disease-related traits. Location effects were significant for several traits, while variety × location interaction was significant for days to maturity and total seed yield but not for most other traits. The local check produced the highest mean total seed yield (1,124.67 kg ha^{-1}) and showed favorable performance for several growth traits and disease scores. These findings indicate that the local cultivar is a valuable source of adaptation for the target area and deserves further characterization and breeding attention.

6. Recommendations

Based on the one-season, three-location results, the local cultivar should be conserved and further evaluated rather than immediately replaced by the tested improved varieties. Participatory on-farm evaluation should be conducted with farmers

in additional locations and seasons to confirm yield advantage, stability, farmer preference, and market acceptability. The local cultivar and Tulu should receive particular attention in future disease-screening work because they showed comparatively low disease scores in the present trial. Further characterization using morphological, biochemical, and molecular approaches is recommended to determine the distinctiveness and breeding value of the local material. Future trials should also include additional recently released varieties and should document disease-rating scales and environmental variables more completely.

Abbreviations

ANOVA	Analysis of Variance
LSD	Least Significant Difference
MoANR	Ministry of Agriculture and Natural Resources
OARI	Oromia Agricultural Research Institute
RCBD	Randomized Complete Block Design
CV	Coefficient of Variation

Acknowledgments

The authors gratefully acknowledge the Oromia Agricultural Research Institute for financial support, Sinana Agricultural Research Center for providing the coriander varieties, Haro Sabu Agricultural Research Center for facilitating the research activities, and the Horticulture Research Team for trial management.

Author Contributions

Alemayehu Latera: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Software, Visualization, Writing – original draft

Kibiru Kena: Investigation, Resources, Validation, Supervision

Ashenafi Debela: Resources, Validation

Funding

Oromia Agricultural Research Institute (OARI).

Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Diederichsen, A. (1996). Coriander (Coriandrum sativum L.). Promoting the conservation and use of underutilized and neglected crops. 3. Institute of Plant Genetics and Crop Plant Research and International Plant Genetic Resources Institute, Rome, Italy.

[2] Giridhar, K., Surya Kumari, S., Rajani, A., Sarada, C., & Naram Naidu, L. (2014). Identification of potential genotypes of coriander (Coriandrum sativum L.) suitable for rainfed vertisols. Applied Biological Research, 16(2), 155–160. https://doi.org/10.5958/0974-4517.2014.00005.6

[3] Nowak, J., & Szempliński, W. (2014). Influence of sowing date on yield and fruit quality of coriander (Coriandrum sativum L.). Acta Scientiarum Polonorum Hortorum Cultus, 13(2), 83–96.

[4] Delaquis, P. J., Stanich, K., Girard, B., & Mazza, G. (2002). Antimicrobial activity of individual and mixed fractions of dill, cilantro, coriander and eucalyptus essential oils. International Journal of Food Microbiology, 74(1–2), 101–109. https://doi.org/10.1016/S0168-1605(01)00734-6

[5] Kubo, I., Fujita, K.-I., Kubo, A., Nihei, K.-I., & Ogura, T. (2004). Antibacterial activity of coriander volatile compounds against Salmonella choleraesuis. Journal of Agricultural and Food Chemistry, 52(11), 3329–3332. https://doi.org/10.1021/jf0354186

[6] Amdie, A., Teshome, S., & Wako, B. (2021). Adaptation trial of coriander (Coriandrum sativum L.) varieties in the midland areas of Guji Zone, Southern Ethiopia. South Asian Journal of Agricultural Sciences, 1(2), 17–20.

[7] Gomez, K. A., & Gomez, A. A. (1984). Statistical procedures for agricultural research (2nd ed.). John Wiley & Sons.

[8] Yan, W., Kang, M. S., Ma, B., Woods, S., & Cornelius, P. L. (2007). GGE biplot vs. AMMI analysis of genotype-by-environment data. Crop Science, 47(2), 643–653. https://doi.org/10.2135/cropsci2006.06.0374

[9] Muleta, Y., Garedew, W., Hailemichael, G., & Gemechu, M. (2025). Growth, seed and essential oil yield responses of coriander (Coriandrum sativum L.) varieties to different levels of nitrogen at Jimma, south western Ethiopia. Science Development, 6(1), 1–16. https://doi.org/10.11648/j.scidev.20250601.11

[10] Haile, T., Soresa, D. N., & Hailu, A. (2026). Effects of blended NPSB fertilizer application rates on coriander (Coriandrum sativum L.) varieties' growth, yield, and yield components. International Journal of Agronomy, 2026, Article 4105994. https://doi.org/10.1155/ioa/4105994

[11] Ministry of Agriculture and Natural Resources (MoANR). (2019). Plant Variety Release, Protection and Seed Quality Control Directorate: Crop Variety Register, Issue No. 22. Addis Ababa, Ethiopia.

[12] Ministry of Agriculture. (2023). Crop variety registration bulletin, 1983–2023. Addis Ababa, Ethiopia.

Biography

Alemayehu Latera is a researcher affiliated with Haro Sabu Agricultural Research Center, Oromia Agricultural Research Institute, Ethiopia. His research interests include plant breeding, genetic diversity, crop variety evaluation, and the identification of adapted and high-yielding crop varieties. His work focuses on improving crop productivity through the evaluation and utilization of genetic resources under local agro-ecological conditions.

Kibiru Kena is affiliated with Haro Sabu Agricultural Research Center, Oromia Agricultural Research Institute, Ethiopia. His research interests include agronomy (crop management)

Ashenafi Debela is affiliated with Haro Sabu Agricultural Research Center, Oromia Agricultural Research Institute, Ethiopia. His research interests include Technical assistance