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TILLAGE-DRIVEN TRADE-OFFS BETWEEN AGRONOMIC PERFORMANCE AND NUTRITIONAL LIPID QUALITY OF FIELD PEA UNDER CONTRASTING GROWING SEASONS

Stroe Traian Ciprian[1,2]*, Popoviciu Dan Răzvan[2], Miron Liliana[2], Panaitescu Liliana[1,2]

[1] University of Agronomic Sciences and Veterinary Medicine of Bucharest, 59 Mărăști Boulevard, 011464.Bucharest, Romania

[2]University Ovidius Department of Natural Sciences, Faculty of Natural and Agricultural Sciences, Ovidius University of Constanța, University Alley, 1, Campus Building B, 900470 Constanța, Romania

* *Correspondence author. E-mail*: str_ciprian@yahoo.com

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ABSTRACT

Conservation tillage may influence not only crop productivity but also the nutritional quality of harvested seeds. This two-year field study (2025–2026) evaluated the Alvesta field pea (Pisum sativum L.) cultivar grown after maize under no-till (NT) and conventional tillage (CV) in southeastern Romania. Agronomic performance was assessed together with seed fatty-acid composition determined by GC-FID and derived nutritional lipid quality indices. Conventional tillage showed higher productivity-related traits in both growing seasons, with thousand-seed weight reaching 255.45 g under CV compared with 235.00 g under NT in 2025, and 283.08 g compared with 273.31 g in 2026, respectively. Agronomic performance was generally higher in the wetter 2026 season. In contrast, NT consistently maintained slightly higher proportions of polyunsaturated (PUFA) and total unsaturated fatty acids (UFA), as well as ω-6 and ω-3 fractions. Linoleic acid was the predominant fatty acid (41.58–42.20 %), followed by oleic (19.73–20.12 %) and α-linolenic acids (16.43–16.78 %). Total UFA remained above 80 % across all year × tillage combinations, confirming the favorable lipid composition of Alvesta pea seeds. The highest PUFA (59.87 %), UFA (81.34 %), and ω-3 (17.22 %) values occurred under NT in 2025. These findings reveal a contrasting response between agronomic performance and seed lipid composition, suggesting that higher productivity does not necessarily correspond to a more favorable nutritional lipid profile. Integrating biochemical quality with agronomic indicators may therefore provide a more comprehensive assessment of tillage systems in field pea production.

INTRODUCTION

Field pea (*Pisum sativum* L.) is an important grain legume in temperate cropping systems due to its nutritional value, biological nitrogen fixation capacity, and suitability for diversified crop rotations. Its productivity and seed quality are strongly influenced by genotype, crop management, and environmental conditions, particularly water availability and temperature (Drew et al., 2007; Janusauskaite, 2023). Drought can restrict germination and early development, while seasonal precipitation and temperature interact with management practices to determine crop performance (Payne et al., 2000; Okçu et al., 2005). Yield formation is also

influenced by crop establishment and the stability of individual yield components (Adela et al., 2010; Neugschwandtner et al., 2020).

Soil tillage is an important component of this interaction. Conservation agriculture minimizes soil disturbance and promotes residue retention, providing an alternative to conventional tillage, particularly in environments where soil and water conservation are critical (Boincean et al., 2020). Long-term tillage systems can modify soil properties and pea productivity (Małecka-Jankowiak et al., 2016), while their effects may extend to plant physiological activity and crop–weed interactions (Zhao et al., 2019; Woźniak and Rachoń, 2019; Bojarszczuk, 2021). Fertilization may further interact with tillage in determining field pea performance (Macák et al., 2020), and differences in yield and protein production between tillage systems have also been reported under Romanian conditions (Șimon et al., 2017).

Conservation soil management is particularly relevant in southeastern Romania, where crop production frequently occurs under limited and irregular rainfall. Previous studies conducted in Dobrogea have highlighted the importance of adapting crop management to climatic variability, including the response of sorghum hybrids to planting date under rainfed conditions (Stroe et al., 2026a). Conservation practices in maize and rapeseed have also been evaluated in Constanța County, demonstrating the increasing interest in reduced soil disturbance under the environmental conditions of the region (Stroe et al., 2025; Stroe and Panaitescu, 2025). More recently, conventional and no-till systems were directly compared for the Romanian pea cultivar 'Nicoleta', confirming the relevance of tillage management for pea production in this region (Stroe et al., 2026b). Soil fertility and appropriate post-harvest management remain additional components of sustainable crop and seed-quality management (Panaitescu, 2021; Mihuț et al., 2023).

Most previous studies comparing tillage systems in pea have focused on soil properties, plant physiology, weed infestation, yield, or conventional quality parameters (Santín-Montanyá et al., 2014; Bojarszczuk, 2021). Much less attention has been given to the potential effects of soil management on the fatty-acid composition and nutritional lipid quality of pea seeds. Although pea is a relatively low-fat legume, its lipid fraction is nutritionally relevant because unsaturated fatty acids predominate. Linoleic (C18:2 n-6), α-linolenic (C18:3 n-3), and oleic (C18:1 n-9) acids are major components of pea seed lipids, whereas palmitic and stearic acids constitute important components of the saturated fraction (Villalobos Solis et al., 2013). Recent evidence also indicates that pea lipid composition may vary according to genotype and environmental conditions (Reveglia et al., 2025).

The balance among saturated (SFA), monounsaturated (MUFA), and polyunsaturated fatty acids (PUFA), together with the ω-6 and ω-3 fractions, provides information on seed nutritional quality that cannot be captured by yield parameters alone. Variation in pea fatty-acid composition among genetic materials further indicates that lipid quality is a biologically responsive seed trait rather than a fixed characteristic. Consequently, evaluating fatty-acid profiles together with derived nutritional lipid indices may provide a more comprehensive assessment of the effects of agricultural management. Despite increasing research on conservation tillage, field evidence directly linking no-till and conventional tillage with fatty-acid composition and nutritional lipid quality of pea seeds remains limited, particularly under the drought-prone conditions of southeastern Europe. This represents a relevant knowledge gap because management practices may affect harvested-seed quality even when their effects on conventional productivity traits are relatively small.

Therefore, this two-year field study evaluated the pea (*Pisum sativum* L.) cultivar Alvesta grown after maize under no-till and conventional tillage systems in Mereni, Constanța County, southeastern Romania. The study focused on the seed fatty-acid profile and derived nutritional lipid quality indices, while plant growth and productivity traits were considered complementary agronomic indicators. We hypothesized that tillage system would modify the fatty-acid composition and nutritional lipid quality of Alvesta pea seeds and that the magnitude of these responses would vary between growing seasons.

MATERIAL AND METHODS

The field experiment was conducted during the 2025 and 2026 growing seasons in the Mereni area, Constanța County, southeastern Romania. The biological material consisted of the field pea (*Pisum sativum* L.) cultivar Alvesta, grown under two contrasting soil management systems: no-till (NT) and conventional tillage (CV). The total experimental area was 6 ha, with 3 ha allocated to each tillage system and divided into three independent 1-ha field replicates. Under CV, the soil was ploughed in autumn, whereas under NT, pea was directly sown without prior soil disturbance. Maize (Zea mays L.) was the preceding crop in both years. The same crop management and plant-protection treatments were applied in both systems to ensure that tillage represented the main experimental factor. Pea was sown on 22 May and mechanically harvested on 29 June in both growing seasons.

Agronomic measurements were performed on ten randomly selected plants from each replicate and included plant height, number of pods per plant, number of seeds per pod, number of seeds per plant, and thousand-seed weight (TSW). These parameters were considered complementary indicators of crop performance, while the main assessment focused on seed lipid composition and nutritional quality.

Fatty-acid composition was determined by gas chromatography with flame ionization detection (GC-FID). Total lipids were extracted from approximately 0.5 g of dried and finely ground pea seeds using chloroform (2:1, v/v), followed by ultrasound-assisted extraction for 60 min. The organic fraction was purified, dried over anhydrous Na_2SO_4, evaporated, and subsequently transesterified to obtain fatty acid methyl esters (FAMEs). FAMEs were analyzed using an Agilent 6890N gas chromatograph equipped with an FID and a ZB-WAX capillary column (30 m × 0.25 mm × 0.25 μm). Helium was used as the carrier gas at 1 mL min^{-1}, with a 1 μL injection volume and a split ratio of 1:20. Individual fatty acids were identified by comparison with reference standards and expressed as percentages of total identified FAMEs. The fatty-acid profile included palmitic, stearic, oleic, linoleic, α-linolenic, arachidic, and gondoic acids. Total saturated (ΣSFA), monounsaturated (ΣMUFA), polyunsaturated (ΣPUFA), and unsaturated fatty acids (ΣUFA), as well as ω-6 and ω-3 fractions, were calculated from the individual fatty-acid concentrations. Nutritional lipid quality was further assessed using the atherogenic index (AI), thrombogenic index (TI), hypocholesterolemic/hypercholesterolemic ratio (h/H), health-promoting index (HPI), and nutritional value index (NVI). Data were expressed as means ± standard deviation (SD) of three independent field replicates. The effects of tillage system, growing year, and their interaction on agronomic traits were evaluated using two-way analysis of variance (ANOVA). Statistical significance was considered at $p < 0.05$.

RESULTS AND DISCUSSIONS

Climatic conditions differed markedly between the two experimental years, particularly in terms of precipitation distribution and thermal regime (Figure 1). During February–June, cumulative precipitation reached only 86.0 mm in 2025, compared with the long-term normal of 191.6 mm, corresponding to a deficit of 105.6 mm (55.1 %). The rainfall shortage was particularly severe in February and March, when only 5.4 and 4.6 mm were recorded, respectively. May was the only month with precipitation slightly above the long-term normal (52.4 vs. 50.2 mm), followed by an exceptionally dry June, with only 0.2 mm compared with the normal value of 53.2 mm.

In contrast, 2026 was considerably wetter, with cumulative precipitation of 204.4 mm, slightly exceeding the long-term normal (+6.7 %). February and March received 54.0 and 33.2 mm, respectively, while May precipitation was also slightly above normal. Nevertheless, June remained relatively dry, receiving 33.4 mm compared with the long-term average of 53.2 mm. Rainfall frequency also differed substantially between years, increasing from 37 rainy days in 2025 to 47 in 2026, while the number of days exceeding 10 mm increased from one to six. Both growing seasons were warmer than the long-term reference during several months, although the strongest thermal deviation occurred in 2025. Mean temperature in March 2025 reached 9.7 °C compared with the normal of 4.2 °C, while June averaged 24.7 °C, 4.3 °C above the long-term value. June 2026 was also warmer than normal (23.4 vs. 20.4 °C), with an absolute maximum temperature of 37.7 °C.

Thus, the two seasons provided contrasting environmental conditions for evaluating tillage effects: 2025 combined pronounced rainfall deficit with stronger thermal stress, whereas 2026 was characterized by substantially greater water availability despite above-normal temperatures. This interannual contrast is particularly relevant when interpreting subsequent differences in the fatty-acid composition and nutritional lipid quality of Alvesta pea seeds under NT and CV systems.

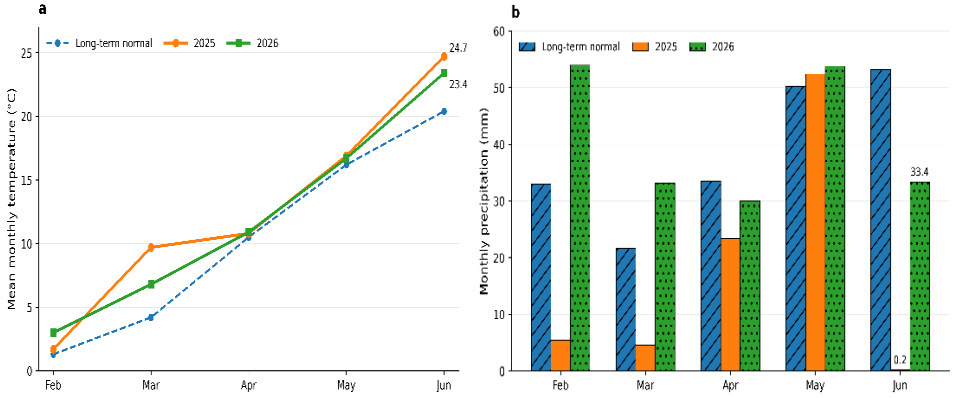


Figure 1. Climatic conditions during the 2025 and 2026 experimental seasons in Mereni, Constanța County, Romania: (a) mean monthly temperature and (b) monthly precipitation, compared with long-term climatic normals.

Agronomic performance showed a consistent response to both tillage system and growing year (Table 1). In 2025, plants grown under CV recorded values approximately 8.7 % higher than those under NT across the evaluated traits. Plant height increased from 77.30 cm under NT to 84.03 cm under CV, while the number

of pods increased from 4.76 to 5.17 plant^{-1}. Similar differences were observed for seeds per pod and seeds per plant. Thousand-seed weight (TSW) increased from 235.00 g under NT to 255.45 g under CV, indicating improved seed development under conventional tillage during the first experimental year. A stronger overall agronomic performance was observed in 2026. Compared with NT in 2025, the evaluated parameters were approximately 16.3% higher under NT and 20.46% higher under CV. The highest values were consequently recorded under CV in 2026, including a plant height of 93.12 cm, 5.73 pods plant^{-1}, 23.13 seeds plant^{-1}, and a TSW of 283.08 g. Importantly, NT also showed a substantial improvement between years, with TSW increasing from 235.00 to 273.31 g. Two-way ANOVA confirmed significant effects of both growing year and tillage system on all evaluated agronomic traits ($p < 0.001$). The year × tillage interaction was also significant for plant height ($p < 0.001$), pods plant^{-1} ($p = 0.042$), seeds pod^{-1} ($p = 0.046$), seeds plant^{-1} ($p = 0.048$), and thousand-seed weight ($p = 0.004$), indicating that the magnitude of the tillage response varied between the two growing seasons.

The superior agronomic performance observed in 2026 coincided with markedly greater water availability compared with 2025. Cumulative February–June precipitation increased from 86.0 mm in 2025 to 204.4 mm in 2026, suggesting that interannual climatic variability contributed substantially to crop response. Nevertheless, CV maintained higher values than NT in both seasons, indicating a consistent tillage-related response under the experimental conditions. Similar effects of tillage on pea productivity and yield components have been reported in previous field studies (Małecka-Jankowiak et al., 2016; Macák et al., 2020). These agronomic differences provide useful context for the biochemical results but should not be interpreted independently of seed composition.

Table 1.

Agronomic performance of the Alvesta pea cultivar under no-till (NT) and conventional tillage (CV) systems during the 2025 and 2026 growing seasons.

Parameter	NT 2025	CV 2025	NT 2026	CV 2026	Year *p*	Tillage *p*	Y × T *p*
Plant height (cm)	77.30 ± 0.46	84.03 ± 0.50	89.90 ± 0.62	93.12 ± 0.58	<0.001	<0.001	<0.001
Pods plant^{-1}	4.76 ± 0.08	5.17 ± 0.08	5.54 ± 0.08	5.73 ± 0.08	<0.001	<0.001	0.042
Seeds pod^{-1}	4.00 ± 0.06	4.35 ± 0.07	4.65 ± 0.08	4.82 ± 0.07	<0.001	<0.001	0.046
Seeds plant^{-1}	19.20 ± 0.28	20.87 ± 0.33	22.33 ± 0.33	23.13 ± 0.35	<0.001	<0.001	0.048
Thousand-seed weight (g)	235.00 ± 2.03	255.45 ± 2.43	273.31 ± 2.38	283.08 ± 2.58	<0.001	<0.001	0.004

Values are presented as mean ± SD (n = 3). The effects of growing year (Y), tillage system (T), and their interaction (Y × T) were evaluated using two-way ANOVA. Statistical significance was considered at $p < 0.05$.

The fatty-acid composition of Alvesta pea seeds showed a consistent overall profile across tillage systems and growing seasons, with relatively small treatment-related differences (Figure 2). Linoleic acid [C18:2 (n-6)] was predominant (41.58–42.20 % of total FAMEs), followed by oleic [C18:1 (n-9); 19.73–20.12 %] and α-linolenic acids

[C18:3 (n-3); 16.43–16.78 %]. Palmitic acid (C16:0) was the major saturated fatty acid (11.56–11.94 %), whereas stearic acid remained below 3 %. This profile is consistent with the characteristic predominance of unsaturated fatty acids previously reported for field pea seeds (Villalobos Solis et al., 2013; Reveglia et al., 2025).

NT generally maintained slightly higher fatty-acid concentrations than CV in both years, with the clearest difference observed for linoleic acid in 2025 (42.20 vs. 41.58 %). Most individual fatty acids also reached their highest values under NT in 2025, whereas lower values generally occurred under CV in 2026. Despite the stronger agronomic performance observed in 2026, several fatty acids were slightly more abundant during the drier and warmer 2025 season. Overall, tillage and growing year produced relatively subtle quantitative shifts rather than major changes in the fatty-acid profile. These differences were further evaluated through the major lipid fractions (SFA, MUFA, PUFA and UFA) and ω-6/ω-3 components.

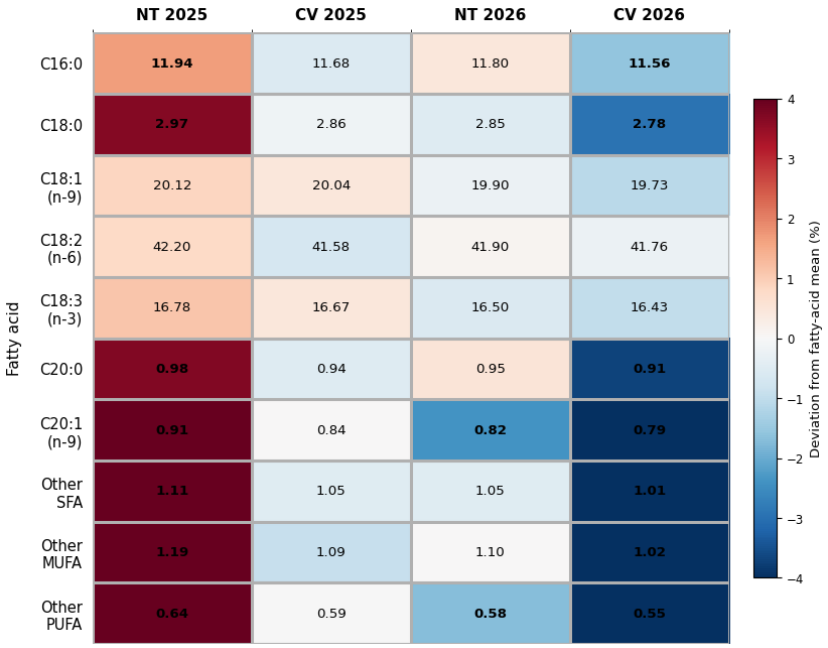


Figure 2. Fatty-acid fingerprint of Alvesta pea seeds under no-till (NT) and conventional tillage (CV) systems during the 2025 and 2026 growing seasons.

The distribution of the major lipid fractions further demonstrated the predominance of unsaturated fatty acids in Alvesta pea seeds (Figure 3). Total unsaturated fatty acids (ΣUFA) represented approximately 80–81 % of total FAMEs across all treatments, with PUFA constituting the largest fraction (58.12–59.87 %), followed by MUFA (21.68–21.98 %). In contrast, SFA accounted for only 16.44–16.89 %. This distribution confirms that the lipid fraction of Alvesta seeds was characterized by a high degree of unsaturation irrespective of tillage system or growing season.

A consistent pattern emerged across the four treatment combinations. NT 2025 recorded the highest values for all major lipid fractions, including ΣPUFA (59.87

%), ΣUFA (81.34 %), ω-6 (42.31 %), and ω-3 (17.22 %). Within the same year, CV resulted in slightly lower values, particularly for PUFA (59.34%) and UFA (80.98 %). The tendency persisted in 2026, when NT maintained higher ΣPUFA, ΣUFA, ω-6, and ω-3 values than CV. The lowest values were generally recorded under CV 2026, where ΣPUFA decreased to 58.12 %, ΣUFA to 80.06 %, and ω-3 to 16.37 %. The interannual response was particularly evident for the polyunsaturated fraction. ΣPUFA decreased from 59.87 % under NT in 2025 to 58.98 % in 2026, while under CV it declined from 59.34 to 58.12 %. The ω-3 fraction showed a similar response, decreasing from 17.22 to 16.50 % under NT and from 17.08 to 16.37% under CV. By comparison, MUFA remained remarkably stable, varying within a narrow range of only 21.68–21.98 %. These results reveal an interesting contrast with the agronomic response. The more favorable 2026 season promoted stronger plant growth and seed development, whereas the highest PUFA, UFA, ω-6, and ω-3 proportions occurred predominantly in the climatically more stressful 2025 season. This suggests that environmental conditions favoring productivity do not necessarily maximize the relative accumulation of nutritionally relevant unsaturated fatty acids. At the same time, the consistently higher PUFA, UFA, ω-6, and ω-3 values under NT compared with CV in both years indicate a modest but reproducible management-related response.

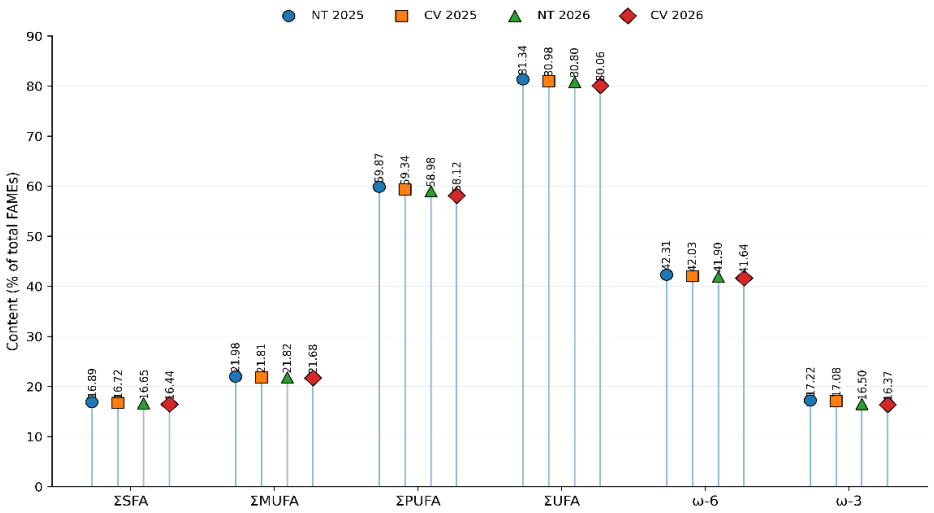


Figure 3. Major fatty-acid fractions of Alvesta pea seeds under no-till (NT) and conventional tillage (CV) systems during the 2025 and 2026 growing seasons.

The high proportion of UFA and particularly PUFA confirms the favorable lipid composition of Alvesta pea seeds. More importantly, the combined year × tillage pattern suggests that evaluation based exclusively on yield-related traits may provide an incomplete picture of crop performance. The nutritional implications of these compositional shifts were therefore further examined using derived lipid quality indices.

The contrasting agronomic response observed between the two growing seasons supports the importance of environmental conditions in determining field pea performance. Previous studies have shown that pea productivity is highly responsive to meteorological variability, particularly precipitation and temperature

during crop establishment and reproductive development (Payne et al., 2000; Janusauskaite, 2023). Drought stress can restrict early growth and subsequently affect yield formation (Okçu et al., 2005), while individual yield components may respond differently depending on crop establishment conditions (Neugschwandtner et al., 2020). In the present experiment, the substantially greater water availability in 2026 coincided with improved plant growth and seed development under both tillage systems, supporting the view that growing-season conditions can partly override management effects on agronomic performance. The consistently higher agronomic values recorded under CV should nevertheless be interpreted within the specific soil and climatic conditions of the experiment rather than as a general advantage of conventional tillage. Long-term studies have demonstrated that tillage modifies soil properties and can consequently influence pea productivity (Małecka-Jankowiak et al., 2016), while differences between conventional and conservation systems may also depend on fertilization and other management factors (Macák et al., 2020). Under Romanian conditions, tillage-related differences in pea yield and protein production have also been reported (Șimon et al., 2017). Particularly relevant to the present study, previous research conducted in the drought-prone Dobrogea region showed different productivity responses of the Romanian pea cultivar 'Nicoleta' under conventional and no-till systems (Stroe et al., 2026). Together, these findings suggest that the response to reduced soil disturbance is strongly context-dependent and may vary with cultivar, season, and local water availability.

More importantly, the present results indicate that the agronomic advantage of CV was not accompanied by a corresponding improvement in lipid composition. Pea seed lipids are naturally characterized by a predominance of unsaturated fatty acids, particularly linoleic, α-linolenic, and oleic acids (Villalobos Solis et al., 2013), but their relative abundance is not necessarily constant across growing environments. Recent metabolic profiling of pea cultivars has demonstrated that environmental variation can modify seed composition and consequently influence nutritional quality (Reveglia et al., 2025). The slightly higher PUFA, UFA, ω-6, and ω-3 proportions maintained under NT in both years therefore suggest that tillage effects on pea should not be evaluated solely through conventional productivity parameters. From this perspective, the present findings extend previous research on conservation tillage in pea, which has largely focused on yield, soil properties, physiological responses, and weed dynamics (Santín-Montanyá et al., 2014; Bojarszczuk, 2021), by indicating that soil management may also be associated with subtle but consistent changes in the nutritional lipid profile of harvested seeds.

CONCLUSIONS

The two-year study showed that tillage system and growing-season conditions influenced both the agronomic performance and lipid composition of Alvesta pea seeds. Conventional tillage resulted in higher productivity-related traits, particularly in the wetter 2026 season. In contrast, no-till consistently maintained slightly higher proportions of PUFA, UFA, ω-6, and ω-3 fatty acids.

Regardless of tillage system, Alvesta seeds exhibited a favorable lipid profile dominated by unsaturated fatty acids, particularly linoleic, oleic, and α-linolenic acids. The results indicate that higher agronomic performance does not necessarily correspond to a more favorable seed lipid profile, highlighting the value of integrating nutritional quality with conventional productivity indicators when comparing tillage systems. From a practical perspective, no-till may therefore represent a valuable

management option when maintaining the nutritional lipid quality of pea seeds is considered alongside agronomic performance and reduced soil disturbance. Further multi-year studies across contrasting environments are needed to determine the stability of this response and clarify the interaction between tillage, climatic variability, and seed biochemical quality.

REFERENCES

Adela J., Niță S., David G., Pîrșan P., & Alda S. 2010. The behaviour of some varieties of pea, soybean and lentils concerning the relationship bacterization–sowing period on the yield and quality in the Timiș Plain. Research Journal of Agricultural Science, 42(4), 82–87.

Boincean B., Voloșciuc L., Rurac M., Hurmuzachi I., & Baltag G. 2020. Conservation agriculture.

Bojarszczuk J. 2021. The influence of soil tillage system on changes in gas exchange parameters of *Pisum sativum* L. Agronomy, 11(5), 1000.

Drew E. A., Gupta V. V. S. R., & Roget D. K. 2007. Herbicide use, productivity, and nitrogen fixation in field pea (*Pisum sativum*). Australian Journal of Agricultural Research, 58(12), 1204–1214.

Janusauskaite D. 2023. Productivity of three pea (*Pisum sativum* L.) varieties as influenced by nutrient supply and meteorological conditions in the boreal environmental zone. Plants, 12(10), 1938.

Macák M., Candráková E., Đalović I., Prasad P. V., Farooq M., Korczyk-Szabó J. & Šimanský V. 2020. The influence of different fertilization strategies on the grain yield of field peas (*Pisum sativum* L.) under conventional and conservation tillage. Agronomy, 10(11), 1728.

Małecka-Jankowiak I., Blecharczyk A., Swędrzyńska D., Sawińska Z., & Piechota T. 2016. The effect of long-term tillage systems on some soil properties and yield of pea (*Pisum sativum* L.). Acta Scientiarum Polonorum. Agricultura, 15(1).

Mihuț C., Mateoc-Sîrb N., Duma-Copcea A., Niță S., Lațo I., Ciolac V. & Okros A. 2023. Assessing the state of fertility (quality) of the soils for sustainable agriculture in Remetea Mare, Timiș County, Romania. Scientific Papers Series Management, Economic Engineering in Agriculture & Rural Development, 23(2).

Neugschwandtner R. W., Bernhuber A., Kammlander S., Wagentristl H., Klimek-Kopyra A. & Kaul H. P. 2020. Yield structure components of autumn- and spring-sown pea (*Pisum sativum* L.). Acta Agriculturae Scandinavica, Section B — Soil & Plant Science, 70(2), 109–116.

Okçu G., Kaya M. D. & Atak M. 2005. Effects of salt and drought stresses on germination and seedling growth of pea (*Pisum sativum* L.). Turkish Journal of Agriculture and Forestry, 29(4), 237–242.

Panaitescu L. 2008. Fitotehnie. Plante oleaginoase. Plante textile – Editura Universitară, Bucureşti, 168 pp.

Panaitescu L. 2021. Condiţionarea și păstrarea seminţelor, Editura Ovidius University Press, Constanța, 111 pp.

Payne W. A., Rasmussen P. E., Chen C., Goller R. & Ramig R. E. 2000. Precipitation, temperature and tillage effects upon productivity of a winter wheat–dry pea rotation. Agronomy Journal, 92(5), 933–937.

Reveglia P., Blanco M., Cobos M. J., Labuschagne M., Joy, M. & Rubiales D. 2025. Metabolic profiling of pea (*Pisum sativum*) cultivars in changing environments: Implications for nutritional quality in animal feed. Food Chemistry, 462

Santín-Montanyá M. I., Zambrana E., Fernández-Getino A. P. & Tenorio J. L. 2014. Dry pea (*Pisum sativum* L.) yielding and weed infestation response under different tillage conditions. Crop Protection, 65, 122–128.

Șimon A., Rusu T., Chețan F. & Chețan C. 2017. The influence of the tillage system on yield and protein quantity in pea cultivation at ARDS Turda.

Stroe T.C., Balaban L.A. & Panaitescu L. 2026a. Resilience of sorghum hybrids to planting date under rainfed conditions in Southern Dobrogea (Romania): Implications for climate-resilient agriculture. Present Environment and Sustainable Development, 20(1), 1–17.

Stroe T.C., Miron L. & Panaitescu L. 2026b. Evaluation of comparative productivity of the romanian pea variety 'Nicoleta' under conventional and no-till systems in the arid region of Dobrogea. Bangladesh Journal of Botany, 55(1), 13–19.

Stroe T.C., Miron L., Lolot N., Panaitescu L. 2025. Evaluation of the technological and economic performance of the no-till system compared to conventional technology in rapeseed cultivation in the Mereni area, Constanța. Annals of the University of Craiova - Agriculture, Montanology, Cadastre Series), 55(1), 163-175.

Stroe T.C., Panaitescu L. 2025. Assessment of the Transition from Conventional Soil Tillage to Minimum Tillage Technology in A Maize Crop with Three Hybrids – A Three-Year Case Study in Lanurile, Constanța County. International Journal of Innovative Approaches in Agricultural Research, 9(3) 217-231.

Villalobos Solis M. I., Patel A., Orsat V., Singh J., & Lefsrud M. 2013. Fatty acid profiling of the seed oils of some varieties of field peas (*Pisum sativum)* by RP-LC/ESI-MS/MS: Towards the development of an oilseed pea. Food Chemistry, 139, 986–993.

Woźniak A. & Rachoń L. 2019. Effect of tillage systems on pea crop infestation with weeds. Archives of Agronomy and Soil Science, 65(7), 877–885.

Zhao C., Chai Q., Cao W., Whalen J. K., Zhao L. & Cai L. 2019. No-tillage reduces competition and enhances compensatory growth of maize (*Zea mays* L.) intercropped with pea (*Pisum sativum* L.). Field Crops Research, 243, 107611.