GMR
The Original

CONSUMER AWARENESS AND CONSUMPTION PATTERNS ASSOCIATED WITH PURCHASE INTENTIONS OF KIWIFRUIT IN THE TRICITY REGION: A CROSS-SECTIONAL SURVEY

Hridya Sharma[1], Dr. Prachi Avinash[2*]

[1]Postgraduate Student, Department of Nutrition & Dietetics, University Institute of Allied Health Sciences, Chandigarh University, Gharuan, Mohali, Punjab 140413, India
[2*]Associate Professor, Department of Nutrition & Dietetics, University Institute of Allied Health Sciences, Chandigarh University, Gharuan, Mohali, Punjab 140413, India, Email: prachiabhatnagar@gmail.com

ABSTRACT

Background: Kiwifruit is a nutrient-dense functional food rich in vitamin C, dietary fibre, polyphenols, carotenoids, and actinidin. Despite increasing availability in Indian cities, consumer knowledge and habitual use remain uneven.

Aims: To assess awareness, consumption patterns, and purchase intention regarding kiwifruit among adults in Chandigarh, Mohali, and Panchkula, and to examine associations and demographic or regional differences in these domains.

Materials and Methods: A descriptive cross-sectional questionnaire survey included a balanced sample of 384 income-earning urban adults aged 20-49 years, with 128 participants from each city. The 40-question instrument covered demographic and socioeconomic characteristics, eight awareness statements, five consumption-pattern statements, sensory and market-barrier items, and six purchase-intention statements. Descriptive statistics, Pearson correlation, one-way analysis of variance with Bonferroni post-hoc tests, and independent-samples t-tests were applied.

Results: The sample comprised 207 males (53.9%) and 177 females (46.1%); 359 respondents (93.5%) belonged to the upper or upper-middle socioeconomic classes. Mean awareness, consumption-pattern, and purchase-intention scores were 27.38 ± 6.82, 15.26 ± 4.84, and 21.15 ± 4.87, respectively. Awareness correlated with consumption pattern ($r = 0.632$, $P < 0.001$) and purchase intention ($r = 0.705$, $P < 0.001$); consumption pattern correlated with purchase intention ($r = 0.514$, $P < 0.001$). Age and gender differences were not significant. Scores differed significantly by city, with Panchkula recording the highest values in all three domains (all $P < 0.001$).

Conclusion: Awareness was closely associated with both habitual consumption and willingness to purchase kiwifruit. Region-specific nutrition communication, practical ripening and storage guidance, and strategies addressing price and availability may support wider acceptance.

KEYWORDS: Food Preferences; Health Knowledge, Attitudes, Practice; Feeding Behavior; Functional Foods; Urban Population

INTRODUCTION

Fruits and vegetables provide vitamins, minerals, dietary fibre, and phytochemicals that contribute to antioxidant defence and may help reduce the risk of nutrition-related chronic disease [1]. Kiwifruit (Actinidia deliciosa) has received increasing attention because of its nutritional value, distinctive sensory characteristics, and versatility in fresh, dried, beverage, functional-food, and nutraceutical applications [2-6]. Green kiwifruit contains approximately 92.7 mg vitamin C, 3 g dietary fibre, 312 mg potassium, and 61 kcal per 100 g edible portion, while gold cultivars may contain substantially more vitamin C [7]. It also supplies vitamin E, folate, vitamin K, lutein, beta-carotene, polyphenols, and actinidin, a cysteine protease that supports protein digestion [21,23,24]. These constituents contribute to reported antioxidant, digestive, immune-supportive, cardiovascular, and anti-inflammatory effects [3,8-13,22,25]. Commercial production is dominated by green Hayward cultivars of A. deliciosa and gold-fleshed cultivars of A. chinensis. In India, kiwifruit is cultivated in temperate and high-altitude regions, including Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh, and Jammu and Kashmir; however, it remains relatively expensive compared with commonly consumed fruits [6,18]. Urban demand is increasing as consumers become more health conscious, yet high price, limited availability, uncertainty about ripeness, storage-related softening or sourness, and the unfamiliar peel may restrict regular consumption.

Food choice is shaped not only by nutrient composition but also by product knowledge, sensory experience, affordability, access, household habits, and perceived usefulness. In the present study, awareness represented knowledge of nutritional, functional, and market-related attributes; consumption pattern represented regularity and planned dietary use; and purchase intention represented willingness to buy, recommend, pay for quality attributes, or adopt value-added products. These constructs are related but not interchangeable: consumers may know that a food is beneficial without consuming it regularly, and habitual consumers may still reduce purchasing when price or availability becomes unfavourable.

Consumer-oriented evidence on kiwifruit is limited in India, particularly at the city level. The Chandigarh-Mohali-Panchkula Tricity is a rapidly urbanising region with relatively high exposure to supermarkets, online grocery platforms, nutrition information, and imported foods. Understanding regional patterns can help nutrition professionals, retailers, growers, and food-industry stakeholders design more appropriate communication and market strategies. Therefore, the study aimed to (1) assess consumer awareness, consumption patterns, and purchase intention regarding kiwifruit among adults in the Tricity region and (2) evaluate associations among these three domains.

Nutritional and functional basis of kiwifruit

Kiwifruit belongs to the genus Actinidia, which includes more than 50 species, although commercial trade is dominated by the fuzzy green A. deliciosa cultivar Hayward and gold-fleshed A. chinensis cultivars. The green fruit is an oval true berry, commonly weighing about 80-130 g, with a brown fibrous skin, green flesh, a pale central core, and rows of edible black seeds. Gold cultivars generally have smoother skin, sweeter yellow flesh, and a higher vitamin C concentration. The balance of soluble solids, organic acids, and volatile esters produces the characteristic sweet-tart flavour, while cultivar, maturity, climate, storage, and postharvest handling influence nutrient composition and sensory quality [4-8,17,18,34,35]. Per 100 g edible portion, green kiwifruit provides approximately 61 kcal, 14.66 g carbohydrate, 1.14 g protein, 0.52 g fat, 3 g dietary fibre, and 312 mg potassium. Its vitamin C concentration is about 92.7 mg/100 g in green Hayward fruit and may reach approximately 161.3 mg/100 g in gold cultivars. Kiwifruit also supplies vitamin E, vitamin K, folate, B-complex vitamins, copper, manganese, zinc, lutein, beta-carotene, chlorophylls, phenolic acids, flavonoids, and procyanidins. Reported total phenolic content varies widely by cultivar and analytical method, reflecting the biological diversity of the fruit. Actinidin, a cysteine protease that can account for a substantial proportion of soluble protein in green kiwifruit, is particularly relevant because it assists the hydrolysis of dietary proteins during gastrointestinal digestion [2-5,7,21,23-26,34-37].

Clinical and experimental evidence supports several potential health benefits of kiwifruit, although the fruit should not be presented as a substitute for medical care or a balanced diet. Vitamin C from kiwifruit is well absorbed in vivo, and regular consumption may improve plasma vitamin C status [3,26]. Dietary fibre, water-retaining cell-wall polysaccharides, and actinidin are associated with digestive function, and clinical trials and systematic evidence have reported improvements in stool frequency, stool consistency, and abdominal comfort among people with constipation [10,27]. Other studies have examined postprandial glycaemia, platelet aggregation, blood pressure, oxidative DNA damage, immune function, and psychological well-being [11-13,22,28-31]. These findings support consumer interest in kiwifruit, but health communication should remain evidence based because the strength and consistency of evidence vary across outcomes.

Consumer behaviour and the Indian market context

Kiwifruit is cultivated domestically in India, although commercial production remains concentrated in temperate and high-altitude regions such as Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh, and Jammu and Kashmir. Domestic production has potential for further expansion, but productivity, cultivar adaptation, postharvest infrastructure, storage, and supply-chain efficiency remain important constraints. Relatively high retail prices, inconsistent local availability, uncertainty about ripeness, a short shelf life after ripening, and an unfamiliar peel texture may limit frequent consumption through supermarkets, local markets, and online grocery channels [5,6,17,18]. Processing into juices, dried slices, powders, fermented products, fibre-rich ingredients, and starch-based foods may improve convenience and widen access, provided that sensory quality and nutrient retention are maintained [14-16,32,33].

The study thus regarded awareness, consumption pattern and purchase intention as interrelated but separate behavioral domains. Awareness reflected knowledge of nutritional, functional, production, and product characteristics. Consumption pattern reflected the extent to which kiwifruit was incorporated regularly and deliberately into household food routines. Purchase intention reflected willingness to buy more frequently, recommend the fruit, choose Indian-grown or naturally ripened options, pay for valued attributes, and try value-added products. Examining these domains together was important because knowledge may create interest without guaranteeing habitual intake, while repeated consumption may strengthen familiarity and future purchasing. The absence of region-specific Indian evidence, particularly within the Chandigarh-Mohali-Panchkula urban cluster, provided the rationale for the present survey.

MATERIALS AND METHODS

Research design and study setting

A descriptive cross-sectional survey was conducted to characterise consumer awareness, consumption patterns, and purchase intention at a single point in time. The study was undertaken in the urban Tricity region of North India: Chandigarh (Union Territory), Mohali (Punjab), and Panchkula (Haryana). This design enabled comparison of participant characteristics and examination of statistical associations among the three study domains without longitudinal follow-up.

Participants, eligibility, and sampling

Convenience sampling was used. Eligible participants were income-earning adults aged 20-49 years who resided in an urban area of Chandigarh, Mohali, or Panchkula and were willing to provide informed consent. The age range was guided by the adult and reproductive-age classifications used in the National Family Health Survey-5 [19]. Individuals younger than 20 years or older than 49 years, rural residents, persons with a known kiwifruit allergy, and persons receiving allopathic, homoeopathic, or Ayurvedic treatment that restricted or contraindicated fruit consumption were excluded.

A total of 411 individuals consented. After screening, 23 incomplete questionnaires were excluded, leaving 388 complete questionnaires. To ensure equal city representation, a final balanced analytic sample of 384 respondents was retained, comprising 128 respondents from each city. The participant-selection process is shown in Figure 1.

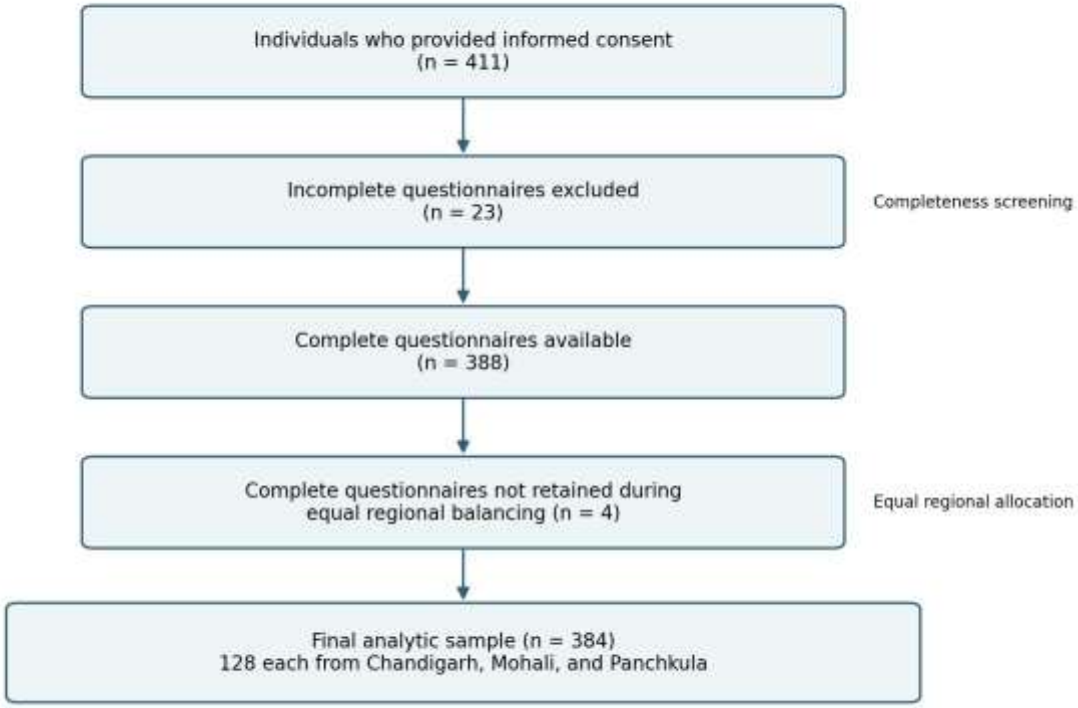

Figure 1. Participant selection and formation of the balanced analytic sample. Four complete questionnaires were not retained when equal regional allocation was applied.

Questionnaire development and scoring

Data were collected with a self-administered structured questionnaire containing 40 questions. The instrument covered consent and eligibility screening, demographic characteristics, socioeconomic status, consumption behaviour, nutritional and functional awareness, sensory perception and market barriers, purchase intention, and an optional comments section. The principal composite scores were derived from eight awareness statements, five consumption-pattern statements, and six purchase-intention statements. Additional questions recorded exact age, city or locality, residence, occupation, dietary preference, frequency of consumption, usual purchase channel, and practical barriers.

Agreement statements were rated on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Accordingly, possible composite-score ranges were 8-40 for awareness, 5-25 for consumption pattern, and 6-30 for purchase intention; higher scores represented greater awareness, more regular consumption, or stronger purchase intention. The awareness items addressed actinidin, cardiovascular effects, edible peel and fibre, low-glycaemic food applications, constipation, Indian production initiatives, differences between gold and green cultivars, and vitamin C. Consumption-pattern items assessed weekly or seasonal use, household purchasing, year-round consumption, staple use, and planned meal inclusion. Purchase-intention items assessed price sensitivity, interest in processed products, preference for Indian origin, recommendation to family, willingness to pay for naturally ripened fruit, and intention to incorporate kiwifruit habitually. Table 1 summarises the instrument and scoring approach.

Table 1. Structure of the 40-question survey instrument and scoring of the primary study domains

Section/domain	Content represented	Primary item count	Scoring/role in analysis
Consent and screening	Voluntary consent; allergy and treatment-related fruit restrictions	2	Eligibility screening; not scored
Demographic and socioeconomic profile	Age, gender, region/locality, urban residence, occupation, education and occupation of family head, monthly family income, dietary pattern	11	Descriptive variables; socioeconomic classification used the 2025 Modified Kuppuswamy Scale

Section/domain	Content represented	Primary item count	Scoring/role in analysis
Consumption habits and patterns	Consumption frequency and purchase channel plus statements on regular, year-round, staple, and planned use	5 scored statements	Likert 1-5; composite range 5-25
Nutritional and functional awareness	Knowledge of actinidin, fibre-rich edible peel, vitamin C, cardiovascular and digestive attributes, cultivar differences, low-GI applications, and Indian production initiatives	8	Likert 1-5; composite range 8-40
Sensory perception and market barriers	Price, ripeness identification, home storage, flavour, Indian versus imported fruit, peel texture, and local availability	7	Descriptive/contextual items; not included in the three primary composite scores
Acceptance and purchase intention	Price-related purchasing, processed products, Indian origin, recommendation, naturally ripened fruit, and preventive dietary use	6	Likert 1-5; composite range 6-30
Suggestions and comments	Open-ended comments or questions	1	Qualitative comments; not included in statistical score comparisons

Pilot testing and validity

The questionnaire was pilot-tested in 27 adults to assess clarity, feasibility, wording, and ease of completion. Participant feedback was used to refine the structure and wording. Content relevance and appropriateness were reviewed by the research supervisor and a statistician before final administration.

Operational definitions and questionnaire content

The awareness score was based on eight statements covering knowledge of actinidin and protein digestion; possible cardiovascular effects related to platelet aggregation; the edible, fibre- and antioxidant-rich peel; potential low-glycaemic applications of kiwi starch; the use of kiwifruit for constipation; Indian production initiatives; differences between gold and green cultivars; and the fruit's vitamin C content. A maximum score of 8-40 was possible for each item. The purpose of the items was to include both attributes well known to consumers and unfamiliar scientific or market information, such as vitamin C, and less familiar information, such as actinidin, cultivar differences and domestic production programmes.

The consumption-pattern score included five items: eating kiwifruit at least once a week during peak season, having it as part of their household's weekly fruit purchase, eating it all year long instead of just when they are ill, and thinking of it as a staple food item, and eating it as part of their breakfast meal plan. The five-item score was between 5 and 25. Using categories of daily, 2-3 times per week, weekly, monthly, rarely, and never, the consumption frequency of descriptive questions was recorded; the usual purchasing channel of descriptive questions was recorded as local fruit market, supermarket, online grocery platform, or purchase by other person in the household.

Seven contextual statements were explored within the sensory perception and market barriers, which included high retail price, difficulty identifying optimal ripeness, sourness or mushiness after improper storage, appreciation of the sweet-tart flavour, perceived freshness of Indian-grown fruit, dislike of the hairy peel and limited availability at local fruit stalls. The three main composite scores did not include these statements as they were provided as explanatory background. Purchase intention was measured with six statements concerning increased buying if price approached that of local fruits, interest in processed products, preference for a "Produced in India" label, recommendation to family for digestive and cardiovascular attributes, willingness to pay slightly more for certified naturally ripened fruit, and intention to include kiwifruit habitually as a preventive dietary practice. The possible purchase-intention score was 6-30.

Socioeconomic classification

Urban family socioeconomic status was classified using the 2025 Modified Kuppuswamy Scale [20]. The scale combines education and occupation of the head of the family with total monthly family income. Component scores were summed to produce a total score from 3 to 29 and classified as upper (26-29), upper middle (16-25), lower middle (11-15), upper lower (5-10), or lower (<5). The 2025 income categories were updated using the Consumer Price Index for Industrial Workers.

For the 2025 Modified Kuppuswamy classification, education of the family head was scored from 1 to 7, occupation from 1 to 10, and monthly family income from 1 to 12. The monthly family income categories ranged from INR 7,988 or below to INR 159,586 or above and were updated using the January 2025 Consumer Price Index for Industrial Workers (CPI-IW 143.2; base 2016 = 100). The summed score ranged from 3 to 29 and was classified into five socioeconomic groups.

Reporting the scale version and income update is important because outdated income thresholds can misclassify urban households [20].

Data collection and ethical considerations

Data collection took place during March-April in the selected urban areas. Respondents were approached at their residences during evening hours or at another convenient time. The study purpose was explained face to face, informed consent was obtained, and participants were informed that participation was voluntary and that they could withdraw at any time. No names were collected, responses were analysed in aggregate, and the questionnaire required approximately 5-7 minutes to complete. The researcher remained available to clarify questions and checked completed forms for missing responses. These procedures supported voluntary participation, anonymity, confidentiality, and data completeness.

Data quality, privacy, and analytic sample formation

The questionnaire introduction stated that participation was voluntary, no names would be collected, responses would be analysed only in aggregate, and people with kiwifruit allergy or medically restricted fruit intake should not participate. Completion required approximately 5-7 minutes. During collection, the investigator explained the study in person, remained available for clarification, and reviewed submitted forms for missing information. Of 411 consenting individuals, 23 questionnaires were excluded because responses were incomplete. The remaining 388 complete forms were distributed across the three areas; four complete forms were not retained when the data set was balanced to 128 participants per city. Thus, the reported inferential analyses relate to the prespecified balanced sample of 384 respondents shown in Figure 1.

Composite scores were calculated by summing the coded responses to the relevant items without weighting. Higher values indicated greater awareness, more established consumption behaviour, or stronger purchase intention. Categorical variables were checked against allowable response codes, and continuous composite scores were summarised using means and standard deviations. Only complete questionnaires were included, so no missing-item imputation was required. Internal-consistency estimates and formal tests of normality and homogeneity of variance were not included in the analysis; these limitations should be considered when interpreting the findings.

Statistical analysis

Data were coded in Microsoft Excel and analysed using the Statistical Package for the Social Sciences. Frequencies and percentages summarised categorical variables, while means and standard deviations summarised composite scores. Pearson correlation coefficients examined pairwise associations among awareness, consumption pattern, and purchase intention. One-way analysis of variance compared mean scores across age groups and cities; significant city effects were examined using Bonferroni-adjusted post-hoc comparisons. Independent-samples t-tests compared male and female respondents. A two-sided P value <0.05 was considered statistically significant.

RESULTS

Participant flow and sample characteristics

As presented in Figure 1, 384 respondents were included in the final analysis after completeness screening and equal regional allocation. The sample was evenly distributed among Chandigarh, Mohali, and Panchkula (33.3% each). Males accounted for 53.9% and females for 46.1%. Participants aged 20-29 years formed the largest age group (38.8%), followed by 30-39 years (35.2%) and 40-49 years (26.0%).

Healthcare professionals constituted 36.2% of respondents, private-sector or corporate employees 33.3%, self-employed or business respondents 20.1%, and government or public-service employees 10.4%. Most participants reported a vegetarian dietary pattern (69.5%), followed by non-vegetarian (22.4%), ovo-vegetarian (7.8%), and vegan (0.3%) patterns. Socioeconomic status was concentrated in the upper-middle class (77.3%) and upper class (16.1%); only 6.5% were in lower-middle or upper-lower classes, and no respondent was classified in the lowest category. Table 2 presents the complete sample profile and overall domain scores.

Table 2. Sociodemographic characteristics and overall study-domain scores of the participants (N = 384)

Characteristic	Category or statistic	n	% or mean ± SD
Region	Chandigarh	128	33.3
	Mohali	128	33.3
	Panchkula	128	33.3
Gender	Male	207	53.9
	Female	177	46.1
Age group	20-29 years	149	38.8
	30-39 years	135	35.2
	40-49 years	100	26.0
Occupation	Healthcare professional	139	36.2

Characteristic	Category or statistic	n	% or mean ± SD
	Private sector/corporate service	128	33.3
	Government/public service	40	10.4
	Self-employed/business owner	77	20.1
Dietary preference	Vegetarian	267	69.5
	Non-vegetarian	86	22.4
	Ovo-vegetarian	30	7.8
	Vegan	1	0.3
Socioeconomic class	Upper (I)	62	16.1
	Upper middle (II)	297	77.3
	Lower middle (III)	22	5.7
	Upper lower (IV)	3	0.8
	Lower (V)	0	0.0
Composite score	Awareness	384	27.38 ± 6.82
	Consumption pattern	384	15.26 ± 4.84
	Purchase intention	384	21.15 ± 4.87

Note: Percentages may not total exactly 100 because of rounding. Domain values are means ± standard deviations.

Associations among awareness, consumption pattern, and purchase intention

The mean awareness score was 27.38 ± 6.82, the mean consumption-pattern score was 15.26 ± 4.84, and the mean purchase-intention score was 21.15 ± 4.87. All pairwise correlations were positive and statistically significant. Awareness had a moderate positive correlation with consumption pattern ($r = 0.632$, $P < 0.001$) and a strong positive correlation with purchase intention ($r = 0.705$, $P < 0.001$). Consumption pattern was also positively correlated with purchase intention ($r = 0.514$, $P < 0.001$). These relationships are illustrated in Figure 2.

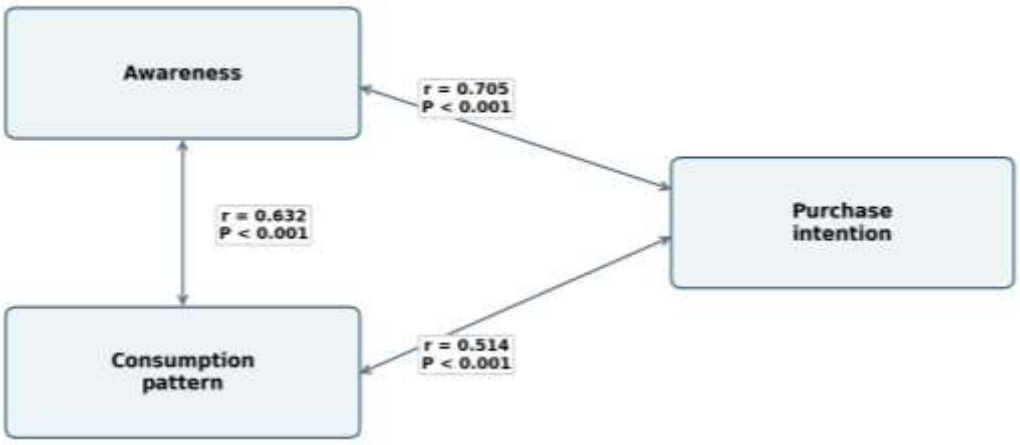

Figure 2. Pairwise Pearson correlations among awareness, consumption-pattern, and purchase-intention scores. All correlations were statistically significant at P < 0.001.

Comparisons by age group, city, and gender

Age group was not associated with any of the three study domains. Consumption-pattern scores were 15.07 ± 4.54, 15.18 ± 5.29, and 15.63 ± 4.67 among respondents aged 20-29, 30-39, and 40-49 years, respectively ($F = 0.420$, $P = 0.658$). Awareness scores were 27.49 ± 6.44, 27.47 ± 7.62, and 27.10 ± 6.27 ($F = 0.114$, $P = 0.892$), and purchase-intention scores were 21.23 ± 4.51, 20.89 ± 5.51, and 21.38 ± 4.51 ($F = 0.327$, $P = 0.722$). City of residence was significantly associated with consumption pattern ($F = 13.644$, $P < 0.001$), awareness ($F = 10.802$, $P < 0.001$), and purchase intention ($F = 9.480$, $P < 0.001$). Panchkula had the highest mean scores for awareness (29.61 ± 4.50), consumption pattern (17.02 ± 3.91), and purchase intention (22.65 ± 3.31). Bonferroni tests found no significant difference between Chandigarh and Mohali for

any domain. Panchkula scored significantly higher than Chandigarh and Mohali for consumption pattern and awareness (all $P < 0.001$), and for purchase intention compared with Chandigarh ($P < 0.001$) and Mohali ($P = 0.001$).
Gender comparisons were not significant. Male and female consumption-pattern scores were 15.48 ± 4.82 and 14.99 ± 4.88 ($t = 0.997$, $P = 0.319$); awareness scores were 27.17 ± 6.60 and 27.62 ± 7.08 ($t = -0.640$, $P = 0.522$); and purchase-intention scores were 20.94 ± 4.67 and 21.40 ± 5.10 ($t = -0.930$, $P = 0.353$). Table 3 gives all inferential comparisons, while Figure 3 displays regional mean scores and standard deviations.

Table 3. Comparison of awareness, consumption-pattern, and purchase-intention scores by age group, city, and gender, with Bonferroni regional post-hoc results

Domain/panel	**Group 1 mean ± SD**	**Group 2 mean ± SD**	**Group 3 mean ± SD**	**Statistic or mean difference**	**P value**
A. One-way ANOVA by age group					
Domain	20-29 years	30-39 years	40-49 years	F	P
Consumption pattern	15.07 ± 4.54	15.18 ± 5.29	15.63 ± 4.67	0.420	0.658
Awareness	27.49 ± 6.44	27.47 ± 7.62	27.10 ± 6.27	0.114	0.892
Purchase intention	21.23 ± 4.51	20.89 ± 5.51	21.38 ± 4.51	0.327	0.722
B. One-way ANOVA by city					
Domain	Chandigarh	Mohali	Panchkula	F	P
Consumption pattern	14.34 ± 5.24	14.41 ± 4.83	17.02 ± 3.91	13.644	<0.001
Awareness	26.17 ± 7.72	26.36 ± 7.28	29.61 ± 4.50	10.802	<0.001
Purchase intention	20.35 ± 5.74	20.45 ± 4.94	22.65 ± 3.31	9.480	<0.001
C. Independent-samples t-test by gender					
Domain	Male	Female	-	t	P
Consumption pattern	15.48 ± 4.82	14.99 ± 4.88	-	0.997	0.319
Awareness	27.17 ± 6.60	27.62 ± 7.08	-	-0.640	0.522
Purchase intention	20.94 ± 4.67	21.40 ± 5.10	-	-0.930	0.353
D. Bonferroni-adjusted regional pairwise comparisons					
Domain	Comparison			Mean difference	P
Consumption pattern	Chandigarh vs Mohali			-0.070	1.000
	Chandigarh vs Panchkula			-2.688	<0.001
	Mohali vs Panchkula			-2.617	<0.001
Awareness	Chandigarh vs Mohali			-0.188	1.000
	Chandigarh vs Panchkula			-3.438	<0.001
	Mohali vs Panchkula			-3.250	<0.001
Purchase intention	Chandigarh vs Mohali			-0.102	1.000

Domain/panel	Group 1 mean ± SD	Group 2 mean ± SD	Group 3 mean ± SD	Statistic or mean difference	P value
	Chandigarh vs Panchkula			-2.297	<0.001
	Mohali vs Panchkula			-2.195	0.001

Note: Negative mean differences indicate that the first named city had a lower mean than the second. $P < 0.05$ was considered statistically significant.

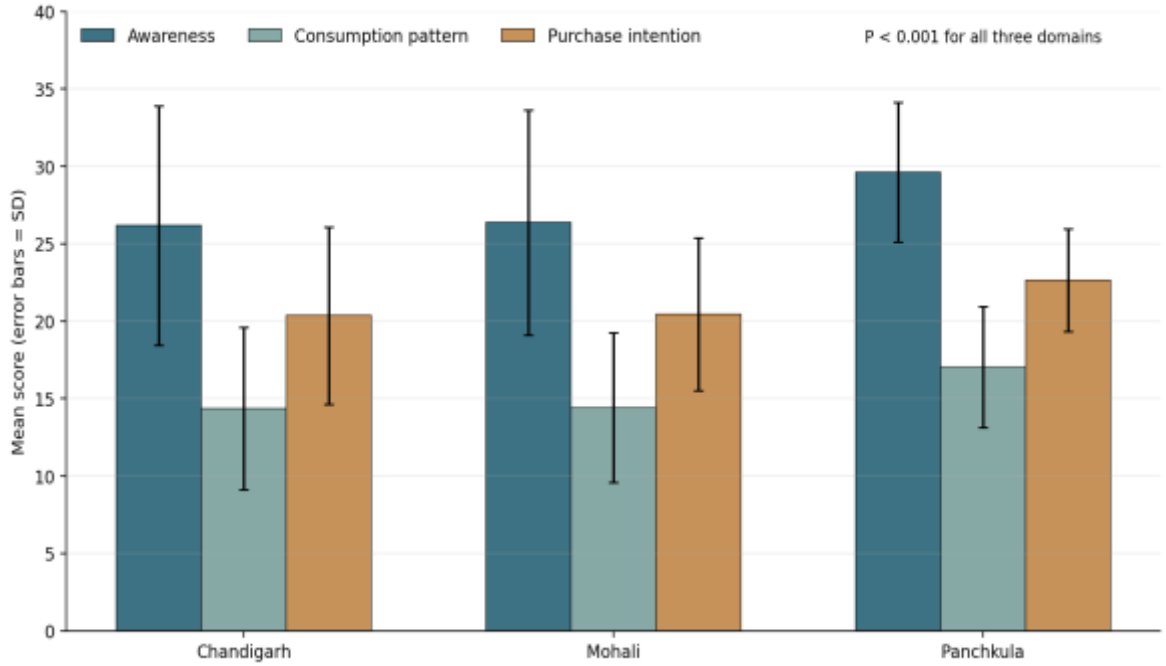

Figure 3. Mean awareness, consumption-pattern, and purchase-intention scores by city. Error bars represent standard deviations. One-way ANOVA indicated significant regional differences for all three domains (P < 0.001).

DISCUSSION

Principal findings

This cross-sectional survey found that awareness, regular consumption, and purchase intention were mutually and positively related among urban adults in the Tricity region. The strongest association was between awareness and purchase intention ($r = 0.705$), followed by awareness and consumption pattern ($r = 0.632$). Consumption pattern also showed a moderate association with purchase intention ($r = 0.514$). These results support the study premise that knowledge and familiarity are important components of consumer acceptance, while also demonstrating that the three constructs are distinct.

The mean scores indicated moderate-to-good awareness and purchase intention, but comparatively less regular consumption. This difference is plausible for a fruit that is recognised for health benefits yet remains relatively expensive and unfamiliar as an everyday staple. A respondent may agree that kiwifruit is nutritious and express willingness to purchase it, while still consuming it only occasionally because of seasonal price, inconsistent availability, uncertainty about ripeness, storage losses, or preference for traditional fruits.

Awareness, health attributes, and consumption behaviour

Kiwifruit has a credible nutritional basis for health-oriented marketing. It is particularly rich in vitamin C and also provides fibre, potassium, folate, vitamin E, carotenoids, polyphenols, and actinidin [2-5,7,21,23,24]. Clinical and experimental literature has linked kiwifruit consumption with improved bowel function, protein digestion, platelet-related cardiovascular effects, antioxidant protection, and aspects of psychological well-being [3,9-13,21,22]. These attributes may explain why respondents with greater awareness showed stronger purchase intention.

However, nutrition communication should be accurate and practical rather than promotional. Consumers need simple guidance on how to identify ripe fruit, ripen firm fruit at home, store it safely, use the edible peel when acceptable, and include it in breakfast, salads, snacks, or other meals. Such information can convert abstract knowledge into habitual behaviour. The questionnaire also identified price, local availability, peel texture, sourness or mushiness after storage, and

uncertainty about ripeness as relevant contextual barriers. Therefore, awareness campaigns alone may have limited effect unless the retail environment and product-handling experience also improve.
The positive relationship between consumption pattern and purchase intention suggests that direct experience reinforces future demand. Regular users are more likely to understand the fruit's texture, flavour, ripening process, and suitable uses, reducing perceived risk at purchase. Repeated household inclusion can also normalise the fruit and strengthen family recommendation. This interpretation is consistent with reviews describing kiwifruit as a functional food that can be incorporated into routine diets in multiple forms [3,5,9].

Regional and demographic findings

Age did not significantly differentiate awareness, consumption pattern, or purchase intention across the 20-49-year range. Similarly, male and female respondents had comparable scores. Shared exposure to online nutrition content, supermarkets, workplace health information, and urban food trends may have reduced traditional demographic differences. These findings suggest that broad adult communication may be appropriate, although future probability-based studies should test whether age, education, income, or gender interactions emerge in more diverse populations.
Regional differences were more pronounced. Panchkula respondents recorded higher means in all three domains, while Chandigarh and Mohali were statistically similar. The study did not directly measure retail density, income distribution, promotional exposure, or local price; consequently, the cause of the regional pattern cannot be established. Possible explanations include differences in supermarket access, household purchasing power, health-oriented social networks, or familiarity with premium fruits. Retail audits and qualitative interviews would be useful to determine whether the observed pattern reflects supply, socioeconomic composition, or consumer attitudes.

Interpretation of the association pattern

The most evident behavioural message from the study is the pattern of correlations. Awareness was best correlated with purchase intention, indicating that awareness of knowledge and perceived health value may precede the formation of a solid eating habit prior to purchase intention. This is possible if the consumer is aware of the vitamin C, fibre, digestive, or antioxidant properties of a premium fruit; and is willing to buy the fruit in the future, but not necessarily because he or she can buy it easily or cheaply. Thus, the high awareness-purchase correlation cannot be taken as a sign that information will lead to more consumption. The cross sectional design also fails to rule out the alternative explanation that current consumers learn something about the fruit as a result of experience and exposure to the product.
The correlation of awareness with consumption was also significant. The knowledge helps to lessen the uncertainty by making the fruit palatable, allowing knowledge of the ripeness and edibility of the peel, and by recommending ways the fruit can be integrated into meals. Consumption also engenders practical knowledge regarding flavour, texture, storage and serving techniques. The moderate consumption-purchase association also indicates a familiarity pathway, for those who consumed kiwifruit more frequently were more likely to purchase it again. Frequent use will decrease risk perception, normalize it as part of the household fruit basket, and facilitate word of mouth recommendation. These reciprocal processes imply that awareness, trial, satisfactory sensory experience, and repeat buying are likely to reinforce each other, which implies that they do not necessarily occur in this clearly defined sequence.

Access, sensory experience, and socioeconomic context

The questionnaire was structured so as to fit the three composite scores with the actualities of food shopping. The factors were included due to their potential to impede the conversion of positive attitudes to behaviour, and include high price, uncertainty about selecting ripe fruit, sourness/speed of softening after storage, hairy peel, and limited availability. These are particularly important to kiwifruit, which is often firm at harvest, demands ripening information, and can be off-sell. Retail interventions should, therefore, incorporate health information with handling information. Information on the firmness, ripening time, refrigeration after ripening, and use of pulp or fruit in addition to nutrient information may provide a more meaningful set of cues.
The regional findings should also be understood in the context of the socioeconomic profile. The study was among adults in the upper or upper-middle income groups, and more than nine-tenths of the participants were in the upper or upper-middle socioeconomic group. The moderate-to-good scores may be reflective, partly, of this concentration as these respondents are more likely to experience organised retail, online grocery services, premium fruits, and digital nutrition content. Within this relatively privileged sample that shows a higher score for Panchkula than Chandigarh and Mohali, the access, promotion, food culture of the household or the composition of the sample could be significant. The higher scores in Panchkula may be due to a number of reasons that were not measured in the multivariable model: outlet density, price, education, or media exposure, and household income.
The lack of differences among the ages and genders suggests that the attitudes measured were common among the sampled adult urban population. There is a possibility that demographic variation was lessened through similar exposure to nutrition information and modern retail. The statistical non-significance does not indicate that age and gender are generally unimportant, however, and the small age range, the convenience sampling, and the socioeconomic homogeneity may have been responsible for reducing the power to detect effects within the subgroups. Future research should involve more heterogeneous households and explore more relations between age, gender, education, income, occupation and city than just age-gender comparisons for the separate groups.

Implications for nutrition practice, retail, and product development

The results justify interventions at the regional level. In low scoring regions, dietitians and public health communicators can provide simple evidence-based messages regarding vitamin C, fibre, digestion benefits, tips on serving, and safe handling. Whether or not the retail display includes ripeness cues, storage directions, estimated shelf life, and price per serving information could be placed in proximity to the product. The risk of first purchase can be lowered with sampling or small packs. Educational content could be provided on digital grocery platforms without being backed up by an unverified disease-treatment claim.

Other factors that are relevant are also the affordability and domestic source. Increased domestic production along with efficient post-harvest handling can help to decrease reliance on imports and increase freshness [6,17,18]. The survey showed that products labelled as made in India as well as added value products were of interest. Kiwifruit can be used in powders, beverages, dried fruit, as fiber rich ingredient or as a low-glycaemic starch in applications [14-16]. This can expand usage, but sensory characteristics, nutritional content, labelling and consumer willingness to pay should be considered prior to commercialization.

All interpretation should be influenced by the fact that the majority of the participants are in the upper and upper middle socioeconomic echelons. These groups might be more likely to access premium foods and nutrition information than lower income households. Policies or campaigns designed for the general population should hence be designed with the consideration of affordability, local fruit alternatives and equitable access, and not as a must have for health.

Strengths and limitations

One of the strengths was the presence of equal representation from Chandigarh, Mohali and Panchkula that facilitated the direct comparison of the areas. A structured instrument was used, expert review, and multiple statistical approaches of the related behavioural domains were assessed. It also included the socioeconomic classification and practical barriers (sensory/market) besides nutritional knowledge.

Several limitations remain. Convenience sampling is not representative and respondents may have been accessible, educated, working, or interested in nutrition. Generalisation to rural and lower income groups is restricted because the sample was comprised of urban and predominantly upper or upper middle socioeconomic status. Self-reported responses can be subject to recall, social desirability and agreement bias. The cross-sectional design reveals the associations but it does not reveal any causality between awareness and consumption or purchase intention. Quantification of internal consistency of the composite scores was not performed, and analysis did not account for income, education, or occupation or other potential confounders simultaneously. Neither a formal test of normality nor a test of homogeneity of variance was also not included. Last, the equal number of regions yielded an incomplete sample of questionnaires, and may not represent the population distribution between the 3 cities.

Future studies are recommended to employ probability sampling in both urban and rural context, report psychometric reliability and construct validation, as well as use multivariable or structural-equation models. A series of studies that are longitudinal and intervention based could be implemented to determine if specific nutrition education results in lasting effects in nutrition purchasing and consumption. Additional work should examine media exposure, health literacy, retail environment, packaging, labelling, willingness to pay, and consumer acceptance of Indian-grown or value-added kiwifruit products.

CONCLUSION

Consumer awareness was strongly associated with purchase intention and moderately associated with regular kiwifruit consumption, while consumption pattern was also positively associated with purchase intention. Age and gender were not significant differentiators, but Panchkula respondents scored higher than those from Chandigarh and Mohali across all three domains. Improving evidence-based awareness, practical product familiarity, affordability, availability, and ripening or storage guidance may help translate interest into regular consumption. Because the study was cross-sectional and convenience-based, these findings should guide hypothesis generation and local programme design rather than causal conclusions.

REFERENCES

1. Prior, R. L. (2009). Antioxidant status in vivo: The case for regular consumption of antioxidant-rich fruits and vegetables. Acta Horticulturae, 841, 75-84. https://doi.org/10.17660/ActaHortic.2009.841.6
2. Drummond, L. (2013). The composition and nutritional value of kiwifruit. Advances in Food and Nutrition Research, 68, 33-57. https://doi.org/10.1016/B978-0-12-394294-4.00003-1
3. Richardson, D. P., Ansell, J., & Drummond, L. N. (2018). The nutritional and health attributes of kiwifruit: A review. European Journal of Nutrition, 57, 2659-2676. https://doi.org/10.1007/s00394-018-1627-z
4. Satpal, D., Kaur, J., Bhadariya, V., & Sharma, K. (2021). Actinidia deliciosa: A comprehensive review on nutritional composition and health benefits. Journal of Food Processing and Preservation, 45, e15588. https://doi.org/10.1111/jfpp.15588
5. Rai, R., Nepal, A., & Rai, S. (2025). Kiwifruit: A review on nutritional composition and its associated health benefits, medicinal importance, and advancement of food technology. Agrobiological Records, 22, 1-13. https://doi.org/10.47278/journal.abr/2025.044
6. James, N. D., Naseer, B., Qadri, T., Fatima, T., & Bhat, T. A. (2021). Kiwifruit (Actinidia deliciosa): Morphology, taxonomy, composition and health benefits. In Functional foods and nutraceuticals (pp. 145-156). Springer. https://doi.org/10.1007/978-3-030-75502-7_11

7. Rasheed, R. B., Hussain, S., & Syed, S. K. (2021). Phytochemistry, nutritional and medicinal value of kiwi fruit. Postepy Biologii Komorki, 48, 147-165.
8. Moysidou, A. M., Cheimpeloglou, K., Koutra, S. I., Finos, M. A., Ofrydopoulou, A., & Tsoupras, A. (2024). Antioxidant and anti-inflammatory bioactives of kiwi and its by-products for functional foods and cosmetics. Applied Sciences, 14, 5990. https://doi.org/10.3390/app14145990
9. Stonehouse, W., Gammon, C. S., Beck, K. L., Conlon, C. A., von Hurst, P. R., & Kruger, R. (2013). Kiwifruit: Our daily prescription for health. Canadian Journal of Physiology and Pharmacology, 91, 442-447. https://doi.org/10.1139/cjpp-2012-0303
10. Gearry, R., Fukudo, S., Barbara, G., Andresen, V., Eswaran, S., Kellow, J., & Muir, J. G. (2023). Consumption of two green kiwifruits daily improves constipation and abdominal comfort: Results of an international randomized controlled trial. American Journal of Gastroenterology, 118, 1058-1068. https://doi.org/10.14309/ajg.0000000000002124
11. Duttaroy, A. K. (2013). Cardioprotective properties of kiwifruit. Advances in Food and Nutrition Research, 68, 273-282. https://doi.org/10.1016/B978-0-12-394294-4.00015-8
12. Carr, A. C., Bozonet, S. M., Pullar, J. M., & Vissers, M. C. M. (2013). Mood improvement in young adult males following supplementation with gold kiwifruit, a high-vitamin C food. Journal of Nutritional Science, 2, e24. https://doi.org/10.1017/jns.2013.12
13. Billows, M., Kakoschke, N., & Zajac, I. T. (2022). The role of kiwifruit in supporting psychological well-being: A rapid review of the literature. Nutrients, 14, 4657. https://doi.org/10.3390/nu14214657
14. Chamorro, F., Carpena, M., Fraga-Corral, M., Echave, J., Rajoka, M. S. R., Barba, F. J., Cao, H., Xiao, J., Prieto, M. A., & Simal-Gandara, J. (2022). Valorization of kiwi agricultural waste and industry by-products by recovering bioactive compounds and applications as food additives: A circular economy model. Food Chemistry, 370, 131315. https://doi.org/10.1016/j.foodchem.2021.131315
15. Zhuang, Z., Chen, M., Niu, J., Qu, N., Ji, B., Duan, X., Liu, Z., Liu, X., Wang, Y., & Zhao, B. (2019). Manufacturing process of kiwifruit powder with high dietary fiber and its laxative effect. Molecules, 24, 3813. https://doi.org/10.3390/molecules24213813
16. Zhao, J., Mao, B., She, Z., Zhao, Q., Luo, Y., Zhao, Z., Lan, T., Xiao, C., & Ma, T. (2025). Kiwi starch: A novel fruit-derived starch with significantly reduced the glycemic index of noodles. LWT, 228, 118134. https://doi.org/10.1016/j.lwt.2025.118134
17. Xia, Y., Wu, D. T., Ali, M., Liu, Y., Zhuang, Q. G., Wadood, S. A., Liao, Q. H., Liu, H. Y., & Gan, R. Y. (2024). Innovative postharvest strategies for maintaining the quality of kiwifruit during storage: An updated review. Food Frontiers, 5, 1933-1950. https://doi.org/10.1002/fft2.442
18. Afiya, R. S. (2023). Advances in production technology of kiwifruit. In A. Kumar, R. Dev, A. Kumar, S. Ahamad, & M. Kumar (Eds.), Advances in production technology of temperate fruits (pp. 232-254). PMW.
19. International Institute for Population Sciences (IIPS) & ICF. (2021). National Family Health Survey (NFHS-5), India, 2019-21. IIPS.
20. Mandal, I., & Hossain, S. R. (2025). Modified Kuppuswamy scale updated for the year 2025. International Journal of Community Medicine and Public Health, 12(5), 2423-2425.
21. Boland, M. (2013). Kiwifruit proteins and enzymes: Actinidin and other significant proteins. Advances in Food and Nutrition Research, 68, 59-80. https://doi.org/10.1016/B978-0-12-394294-4.00004-3
22. Hunter, C. D., Greenwood, J., Zhang, J., & Skinner, A. M. (2011). Antioxidant and natural protective properties of kiwifruit. Current Topics in Medicinal Chemistry, 11, 1811-1820. https://doi.org/10.2174/156802611796235134
23. Li, H. Y., Yuan, Q., Yang, Y. L., Han, Q. H., He, J. L., Zhao, L., & Qin, W. (2018). Phenolic profiles, antioxidant capacities, and inhibitory effects on digestive enzymes of different kiwifruits. Molecules, 23, 2957. https://doi.org/10.3390/molecules23112957
24. Nishiyama, I., Yamashita, Y., Yamanaka, M., Shimohashi, A., Fukuda, T., & Oota, T. (2004). Varietal difference in vitamin C content in the fruit of kiwifruit and other Actinidia species. Journal of Agricultural and Food Chemistry, 52, 5472-5475. https://doi.org/10.1021/jf049398z
25. Wang, K., Wang, Y., Chen, S., Gu, J., & Ni, Y. (2022). Insoluble and soluble dietary fibers from kiwifruit (Actinidia deliciosa) modify gut microbiota to alleviate high-fat diet and streptozotocin-induced type 2 diabetes in rats. Nutrients, 14, 3369. https://doi.org/10.3390/nu14163369
26. Carr, A. C., Pullar, J. M., Moran, S., & Vissers, M. C. M. (2012). Bioavailability of vitamin C from kiwifruit in non-smoking males: Determination of healthy and optimal intakes. Journal of Nutritional Science, 1, e14. https://doi.org/10.1017/jns.2012.15
27. Cokro, F., Vashti, E., Nurcahyanti, A. D. R., Sumarpo, A., & Malasao, R. (2024). A systematic review and meta-analysis of kiwifruit's impact on functional constipation. Biomedical and Pharmacology Journal, 17, 635-646. https://doi.org/10.13005/bpj/2891
28. Collins, B. H., Horská, A., Hotten, P. M., Riddoch, C., & Collins, A. R. (2001). Kiwifruit protects against oxidative DNA damage in human cells and in vitro. Nutrition and Cancer, 39, 148-153. https://doi.org/10.1207/S15327914NC391_20
29. Karlsen, A., Svendsen, M., Seljeflot, I., Laake, P., Duttaroy, A. K., Drevon, C. A., Arnesen, H., Tonstad, S., & Blomhoff, R. (2013). Kiwifruit decreases blood pressure and whole-blood platelet aggregation in male smokers. Journal of Human Hypertension, 27, 126-130. https://doi.org/10.1038/jhh.2011.116

30. Mishra, S., Edwards, H., Hedderley, D., Podd, J., & Monro, J. (2017). Kiwifruit non-sugar components reduce glycaemic response to co-ingested cereal in humans. Nutrients, 9, 1195. https://doi.org/10.3390/nu9111195
31. Skinner, M. A., Loh, J. M. S., Hunter, D. C., & Zhang, J. (2011). Gold kiwifruit (Actinidia chinensis Hort16A) for immune support. Proceedings of the Nutrition Society, 70, 276-280. https://doi.org/10.1017/S0029665111000048
32. Lan, T., Lv, X., Zhao, Q., Lei, Y., Gao, C., Yuan, Q., Sun, X., Liu, X., & Ma, T. (2023). Optimization of strains for fermentation of kiwifruit juice and effects of mono- and mixed-culture fermentation on sensory and aroma profiles. Food Chemistry: X, 17, 100595. https://doi.org/10.1016/j.fochx.2023.100595
33. Kumar, S., Pipliya, S., Srivastav, P. P., Srivastava, B., Battula, S. R., & Sen, R. (2024). Cold plasma processing of kiwifruit juice: Effects on physicochemical and nutritional properties. Journal of Food Science, 89, 6127-6141. https://doi.org/10.1111/1750-3841.17284
34. Yuan, X., Zheng, H., Fan, J., Liu, F., Li, J., Zhong, C., & Zhang, Q. (2022). Comparative study on physicochemical and nutritional qualities of kiwifruit varieties. Foods, 12, 108. https://doi.org/10.3390/foods12010108
35. Zhang, H., Zhao, Q., Lan, T., Geng, T., Gao, C., Yuan, Q., Zhang, Q., Xu, P., Sun, X., Liu, X., & Ma, T. (2020). Comparative analysis of physicochemical characteristics, nutritional components, and antioxidant capacity of fifteen kiwifruit cultivars. Foods, 9, 1267. https://doi.org/10.3390/foods9091267
36. Jayawardana, I. A., Boland, M. J., Higgs, K., Zou, M., Loo, T., McNabb, W. C., & Montoya, C. A. (2021). The kiwifruit enzyme actinidin enhances the hydrolysis of gluten proteins during simulated gastrointestinal digestion. Food Chemistry, 341, 128239. https://doi.org/10.1016/j.foodchem.2020.128239
37. Kaur, L., Mao, B., Bailly, J., Oladeji, O., Blatchford, P., & McNabb, W. C. (2022). Actinidin in green and SunGold kiwifruit improves digestion of alternative proteins: An in vitro investigation. Foods, 11, 2739. https://doi.org/10.3390/foods11182739