OBJETIVE

METHODOLOGY

RESULTS

Perception

50 consumers

24 consumers

13 consumers

14 consumers

Total = 101 consumers

CLEAN LABEL

ORIGINAL LABEL

Projective mapping

Attitude questionnaire

Omnivores

vs

"Other diets"

Different perception

Clean label trend

Meat analogues

More negative perception

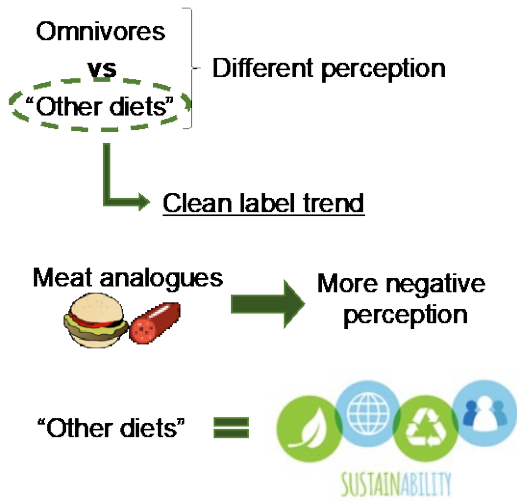"Other diets" =

SUSTAINABILITY

Highlights

- Study has focused on clean label plant-based products.

- Participants with different diets (omnivorous, flexitarian, vegetarian and vegan) were included.

- Consumer diets affect consumer perception for clean label plant-based food.

- Consumers' attitudes with different diets were discussed.

- Future research recommendations were suggested.

1   **Green or Clean? Perception of clean label plant-based products by**

2   **omnivorous, vegan, vegetarian and flexitarian consumers.**

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4   Ana Teresa Noguerol[1],*, M. Jesús Pagán[1], Purificación García-Segovia[1], Paula

5   Varela[2]

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7   [1] Universitat Politècnica de València, Food Technology Department, Food

8   Investigation and Innovation Group, Camino de Vera s/n, 46022 Valencia,

9   Spain

10   [2] Nofima AS, P.O. Box 210, 1431, Ås, Norway

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12   *Corresponding author. Tel.:0034963877000 ext.73621; fax: 0034963877369.*

13   *E-mail address: annome@etsiamn.upv.es (A. T. Noguerol).*

14

15   **Abstract**

16   Consumers are increasingly interested in health and sustainability aspects of

17   their diets. Meat reduction diets have gained popularity with some consumers,

18   leading to an increase in plant-based products in the markets. Additionally, the

19   demand for more natural and healthier products is associated with the clean label

20   trend. But how these two trends relate to each other, has not yet been widely

21   investigated. The aim of the present research was to explore the perception of

22   different consumers (vegans, vegetarians, flexitarians and omnivores), towards

23   clean label, plant-based products in order to better understand their motivations

24   and attitudes. Consumers in Spain, followers of these four diets, participated in a

25   projective mapping task - categorisation of twenty plant-based products (ten

26 clean label and ten original products) - and answered a health and sustainability

27 attitudes survey. The results showed that according to the diet followed by the

28 consumers, they categorised and perceived the products differently, in line with

29 their attitudes. Meat-reducer and avoider consumers paid more attention to

30 quality and health and presented a greater concern for animal welfare and

31 sustainability. Also, they focused on the clean label status for product

32 categorization, while omnivores did not separate between original and clean label

33 products. The present study shows a first exploration of how consumers with

34 different relation to meat (frequent consumption-reduction-avoidance) perceive

35 clean label plant-based products, in relation to their attitudes to health and

36 sustainability, a building block on the way to support consumers in the transition

37 to healthier, more sustainable diets.

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1. INTRODUCTION

In recent years, meat reduction diets have gained popularity with some consumers striving to shift to more sustainable and healthier diets. Depending on the levels of strictness and adherence to dietary meat restriction there are different diets (Eveleigh, Coneyworth, Avery & Welham, 2020). Typically, vegans do not consume any animal-derived products, vegetarians exclude meat and fish but may consume milk and eggs and flexitarians who are semi-vegetarian because do not exclude meat products (red meat or other meats) but limit their consumption (Derbyshire, 2017; Rosenfeld, Rothgerber & Tomiyama, 2020). Lantern Study (2019) indicated an increase in Spain of 27% in this type of diets, with 0.5% vegans, 1.5% vegetarians and 7.9% flexitarians, being these percentages lower than in other places in Europe such as Germany and England. Despite these data, 87.8% of the population declares itself omnivores (Lantern Study, 2019). The health benefits of limiting or excluding meat and meat derived products include a lower risk of overweight and obesity, type 2 diabetes, coronary heart disease and certain cancers such as colorectal cancer (World Health Organization, 2015; Malek & Umberger, 2021). Furthermore, following these diets also has environmental benefits such as the reduction of greenhouse gas emissions (GHG) and land use demand (Tilman & Clark, 2014; Rabès et al., 2020).

This reduction in meat consumption entails having to increase the intake of plant-based proteins and fresh fruits and vegetables (Kumar, 2016), thus, this consumption is replaced by plant-based meat analogues. Aschemann-Witzel (2020) indicated that the term "plant-based" is used to describe a recent consumer trend of avoiding animal-based products and choosing plant-based

alternatives instead, reducing the amount of animal-based foods in diets; so it can be understood in two ways, excluding or reducing animal-based products. Fardet (2017) classified "plant-based foods" into fruits, vegetables, legumes, grains, nuts, and seeds; their derived processed counterparts (breads, pasta, breakfast cereals, cooked and fermented vegetables and legumes, and fruit purées, juices, and jams); and their derived ingredients (oleaginous seed–derived oils, sugars, and some herbs and spices). However, these products are usually produced using a significant amount of water, flavourings, oil or fat, binding agents, and colouring agents, apart from protein (textured and non-textured form) (Kyriakopoulou, Keppler & van der Goot, 2021), what can be perceived as negative.

From a technological point of view, food additives play an important role in the development of food products, but these additive names, sometimes difficult to pronounce, give rise to the impression of unfamiliarity, which in turn results in perceptions of higher health risk (Varela & Fiszman, 2013). Thus, the trend of clean label products has led consumers to consider what components are used in the food products that they eat in everyday life (Asioli et al., 2017). This trend has emerged due to the concern of consumers about healthiness and sustainability of food products (Euromonitor International, 2016). Despite this trend, there is still no definition or specific regulations/legislation on what is considered as clean label (Aschemann-Witzel, Varela & Peschel., 2019). However, it is generally known that these products contain ingredients perceived as natural, harmless, simple, and those that consumers know and use regularly (Ingredion, 2014). In particular, many consumers trying to reduce meat consumption to shift to healthier and more sustainable diets, find it that highly

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93   processed, plant-based meat analogues can be a contradiction, perceiving them

94   as not healthy, and full of additives (Varela et al., 2021). How these two trends

95   (plant-based and clean label) relate to each other, has not yet been widely

96   investigated. Consumer research, thus, needs to support consumers to enhance

97   trust and acceptance towards more sustainable alternatives (Aschemann-Witzel

98   et al., 2019).

99   Hereby, the aim of this research was to explore the perception of consumers

100   following different diets (vegan, vegetarian, flexitarian and omnivorous), towards

101   clean label, plant-based products as compared with their additive-added

102   counterparts, in order to better understand their motives and attitudes, with the

103   view of a transition to healthier and more sustainable diets.

104

105   **2. MATERIAL AND METHODS**

106   **2.1. Consumers**

107   The recruitment goal was to include both consumers interested in plant-based

108   food products and consumers who are generally not interested in this type of

109   food, so consumers were invited that followed different diets with regards to meat

110   consumption (vegan, vegetarian, flexitarian and omnivorous). Participants

111   (n=101) were recruited from vegan and vegetarian consumer groups, university

112   areas and coffee places, who voluntarily filled out the complete survey. As the

113   aim of this research was to find an and spontaneous product differentiations, all

114   participants were untrained or naïve assessors (Dehlholm, 2014). Table 1 shows

115   the socio-demographics information of the 101 respondents, the sample included

116   32 men, 68 women and 1 who preferred not to indicate their gender. Consumers

117   interviewed were mostly students (46.53%) and people employed full-time

118   (28.71%). Many publications pointed out young people as a motor of change in

119   the dietary green-shift (Lu, Bock & Joseph, 2013; Cerri, Testa & Rizzi, 2018; Lago

120   et al., 2020). Additionally, 50 respondents identified themselves as followers of

121   an omnivorous diet, 24 of a flexitarian diet (they try to reduce the meat and animal

122   by-products consumption), 14 of a vegan diet (purely plant-based), and 13 of a

123   vegetarian diet (they can include egg and dairy products). This implies a good

124   representation of the followers of each diet based on the distribution by Spanish

125   diet in 2019 (Lantern study, 2019).

126

127   **2.2. Stimuli**

128   As the global demand for more plant-based food alternatives and specially for

129   meat substitutes and ready-to-eat food have been increasing rapidly in Europe in

130   recent years (Lantern study, 2019; EUVEPRO 2019; Aschemann-Witzel et al.,

131   2020). After visiting different supermarkets in Spain (specialised and non-

132   specialised on vegan and vegetarian products), eight vegan and two vegetarian

133   commercial products were selected, to represent a variation of widely available

134   plant-based available products within these categories (sausages, burger,

135   vegetable steak, salami, croquettes, meatballs, quinoa spread, *sobrassada*,

136   pizza and quinoa with vegetables) (Table S1). The ingredient label of each

137   product was presented on two different cards with the same product picture, but

138   different ingredient lists, one presenting a clean label and the other the original

139   label (see an example card in Fig. 1). In general, the intention in the clean label

140   version was to take out additives, preservatives, allergens, and all ingredients

141   coming from animals to represent the plant-based and the clean label trends.

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2.3. Projective mapping

Projective mapping (Risvik et al., 1994) was used to study the perception of clean label plant-based products and their mainstream counterparts. This methodology was applied due to its success to study undirected, top-of-mind consumer perception, and has been applied before in relation to claims, nutritional info and other product and ingredient features in different food categories (Varela & Ares, 2012; Carrillo et al, 2012; Varela et al, 2017; Aschemann-Witzel et al., 2019). Respondents were asked to place the cards on a DIN A2 white sheet according to their perceived similarities and differences. They were asked to complete the task using their own criteria and they were told that there were no right or wrong answers. After completing the projective mapping task, consumers were asked to provide a description to the groups they made on the sheet paper, or the reason why they mapped them in that way. As a help to explain and understand the task an example of projective mapping showing the categorisation of different objects on a sheet was provided.

2.4. Attitude questionnaire

The survey was conducted through a selection of questions from different questionnaires on nutrition knowledge, food choice, and environmental concern, as described below. The participants carried out this questionnaire, using a tablet device, after finishing the projective mapping task.

2.4.1. General nutrition knowledge

The questions about nutrition were selected from the 'General Nutrition Knowledge Questionnaire' (GNKQ) described by Parmenter and Wardle (1999). Selected questions were relevant to plant-based products consumption. The

selected questions from the dietary recommendations section was *"Do you think*

health experts recommend that people should be eating more, the same amount,

or less of these foods?"; from knowledge of food sources, that is, which foods

contain which nutrients were *"Do you think these are high or low in protein?", "Do*

you think these are high or low in fibre/roughage?", "Do you think experts call

these a healthy alternative to red meat?" and *"Which one of the following has the*

most calories for the same weight?"; from the dietary choices were *"Which would*

be the best choice for a low fat, high fibre snack?" and *"Which would be the best*

choice for a low fat, high fibre light meal?"; and from the diet- disease associations

were *"Are you aware of any major health problems or diseases that are related*

to a low intake of fibre?", "Do you think these help to reduce the chances of getting

certain kinds of cancer?" and *"Do you think these help prevent heart disease?".*

2.4.2. Motives underlying food choice

The questions about motivational factors were selected from the 'Food Choice

Questionnaire' (FCQ) developed by Steptoe, Pollard and Wardle (1995), which

involved nine motivational dimensions (or factors). However, in this study just

seven factors were chosen (health, mood, convenience, sensory appeal, natural

content, price and ethical concern) and their respective items to evaluate were

selected. The survey was evaluated by answering the following question: *'It is*

important to me that the food I eat on a typical day…'. In order to know more

about the ethical food choice motives, the ethical concern factor was expanded,

and the animal welfare factor included according to Lindeman and Väänänen

(2000). As described Carrillo, Varela, Salvador and Fiszman (2011) all the

questionnaire items were answered on a seven-box scale, labelled from 'not at

192 all important' to 'very important', to increase the ability to discriminate among food

193 choice motives.

2.4.3. Health and Ecological concern

195 In order to understand the health concerns related to the naturalness of foods,

196 the Factor 3 labelled *Natural product interest* from the 'Health and Taste Scales'

197 (Roininen, Lähteenmäki & Tuorila, 1999) was selected. This factor was

198 composed of six items involving an interest in eating foods that do not contain

199 additives and are unprocessed. Additionally, to explore general environmental

200 attitudes, 6-items from the 'New Ecological Paradigm Scale' (NEP) described by

201 Dunlap, Van Liere, Mertig and Jones (2000) were chosen. These items were

202 selected to tap into each of the three facets of an ecological worldview: the reality

203 of limits to growth ('the earth has plenty of natural resources if we just learn how

204 to develop them' and 'the earth is like a spaceship with very limited rooms and

205 resources'), anti-anthropocentrism ('plants and animals have as much right as

206 human to exist'), and the possibility of an eco-crisis ('humans are severely

207 abusing the environment', 'the so-called "ecological crisis" facing humankind has

208 been greatly exaggerated' and 'if thing continue on their present course, we will

209 soon experience a major ecological catastrophe'). All the statements were scored

210 on a 7-point scale with the categories ranging from 'strongly disagree' to 'strongly

211 agree'.

212

2.5. Data analysis

214 All analyses were performed using the software XLStat 2021.2.1 (Addinsoft,

215 USA).

2.5.1. Projective Mapping

The x and y coordinates form each product were recorded in the projective maps from all respondents, measured in centimetres as the distance from the lower left corner. Data were collected and recorded for each consumer group (omnivores and other diets). Terms generated in the descriptive step of the PM were categorized by consensus of two researchers, considering word synonyms and the interpretation of each map as described Aviles et al. (2020), the frequencies of mention of the categorized attributes were counted across all consumers and for each experimental group of the consumer panel, for being able to analyse the results for all consumers and each group separately. To reduce the number of descriptors, only those mentioned by at least 10% of the respondents (in each dietary group) were used (Aschemann-Witzel et al., 2019). A Multifactor Analysis (MFA) was used to analyse the projective mapping task for each consumer group.

2.5.2. General knowledge questions

In order to analyse the GNKQ, the number of correct answers for each section were counted for each consumer group and an analysis of variance was conducted to observe the differences between the groups.

2.5.3. Attitude questions

An analysis of variance was performed for each item and factor of the FCQ, 'Health and Taste Scales' and NEP. A factor analysis (FA) with varimax rotation was conducted to study the factor structure.

2.5.4. Consumer segmentation analyses

Data were analysed based on the *a priori* consumer segmentation, focused on understanding consumers following different diets. Some analyses compare two groups: omnivores vs "other diets", to explore the differences in perception between omnivore consumers and those who completely avoid animal products,

242 avoid or reduce their meat consumption (vegan, vegetarian and flexitarian). This

243 was also to have stable sample configurations in the projective mapping

244 outcomes, having 50 consumers in each group (Vidal et al., 2014). For having

245 more details on the perception of the products and the different consumer

246 motivations by the "other diets" group, it was divided for further analysis into

247 vegans/vegetarians and flexitarians (the vegan group was too small to draw

248 conclusions on its own).

249

250 **3. RESULTS**

251 It is important to point out that the purpose of this research was not to draw

252 conclusions on the acceptability of specific products or market implications, but

253 on how the information on the label influences the product descriptions and

254 product choice information by consumers with different diets.

255

256 **3.1. Perception and categorisation of plant-based products via Projective**

257 **Mapping: omnivores vs other diets**

258 **3.1.1. Omnivores**

259 Consumer categorisation showed a clear distinction into three groups of

260 products, which were set apart from each other in the first two dimensions of the

261 MFA (Fig. 2a). The first group located in the upper left quadrant contains the four

262 labels of the two plant-based products which are breaded (croquettes and

263 meatballs), without differentiating if they were original or clean label (CL). In the

264 lower left quadrant, the second group was located, comprising both options of

265 pizza and quinoa with vegetables, again without separating the original from the

266 clean label. Finally, the third group located in the upper and lower right quadrant

267 contained the meat analogues like burgers, steaks and cold cuts, and the quinoa

268 spreads, without separation of original and clean labels. The Fig. 2b shows the

269 representation of the terms obtained in the descriptive by omnivore group.

270 Sixteen terms were obtained in three categories, their distribution was as follows:

271 use and type of products (7 different terms: "ready-to-eat", "necessary to heat",

272 "cold cut", "spreadable", "breaded", "fried", and "meat analogue"), nutrition and

273 health characteristics (5 different terms: "simple/additive free", "with additives",

274 "natural", "artificial/processed food", and "healthy"), and composition/ingredients

275 (4 different terms: "allergen", "gluten", "vegetable (plant-based)", and

276 "carbohydrates"). Croquettes and meatballs products were described as

277 breaded, fried and with gluten; the pizza and quinoa with vegetables were

278 described as healthy, ready-to-eat, vegetable and rich in carbohydrates. On the

279 other hand, the third, larger and more heterogeneous group, consisting of burger,

280 sausages, salami, vegetable steak, *sobrassada* and quinoa spread, was

281 described as meat analogue, natural, simple/additive free, necessary to heat,

282 cold cut, spreadable and allergen. Thus, the third group of products was more

283 positively perceived by omnivores although the products of the second group

284 were classified as healthy. The attributes "artificial/processed food" and "with

285 additives", and "allergens" were located in the middle of the map, not well

286 correlated to the perceptual space, and describing all the items in all the groups

287 (regardless of CL or not). Omnivore consumers did not use these attributes as

288 main drivers for product categorization, but rather classified products by their type

289 and utilization, as highlighted also by the fact that clean label and original ones

290 were mapped together within each category.

291

3.1.2. Other diets (vegans, vegetarians and flexitarians)

The categorisation of the "other diets" group (vegan, vegetarian and flexitarian consumers) resulted in four groups (Fig. 3a). The map was divided into two large groups. In the upper left part of the map was located the first group which contained the clean-label products and the second group formed by originals products was located in the bottom right part of the map. This shows that for consumers reducing or avoiding meat and other animal products ("other diets"), the status of clean label is an important characteristic for their perception of plant-based foods, quite different to the map obtained for omnivorous consumers.

The descriptors obtained by "other diets" group are shown in Fig. 3b. In this case, seventeen terms were collected, and separated in a similar way as for the omnivore group. Four categories were obtained and their distribution was as follows: use and type of products (4 different terms: "ready-to-eat/fast food", "spreadable", "fried", and "meat analogue/replacer"), nutrition and health characteristics (6 different terms: "simple/additive free", "with additives", "natural", "artificial/processed food", "non-healthy" and "healthy"), composition/ingredients (3 different terms: "allergen", "animal", and "vegetable (plant-based)" and, preference and consumption (4 different terms: "frequently", "occasionally", "would buy it/look nice" and "wouldn't buy it/don't like it").

Clean label products were characterised as additive-free and natural (top left) while the original products were described as with additives (bottom right quadrant). In both groups of products (CL and original), the products on the left (quinoa spread, *sobrassada* and quinoa with vegetables) were perceived as more natural, since descriptors such as simple/additive-free, natural, healthy, would buy it/look nice, and frequently consumption were used. However, products which

317   simulate meat (burger, salami, vegetable steak and sausages) were located on

318   the right and they were more negatively described with terms as with additives,

319   wouldn't buy it/don't like it, artificial/processed foods, non-healthy and with animal

320   ingredients, what supposes a rejection towards these types of products by vegan

321   consumers. Products located in the middle of the map were classified by their

322   type and consumption. "Other diet" consumers evaluated the products for their

323   nutritional and health aspects, also highlighted by the fact that the clean label and

324   the originals were mapped separately.

325

326   **3.2. Perception and categorisation of plant-based products via Projective**

327   **Mapping: flexitarians vs vegans/vegetarians**

328   Fig. 4a shows the categorisation of the flexitarian group and Fig. 4b the

329   descriptors obtained by this group. Flexitarians categorized the products in two

330   large groups, divided according to F1, on the right the clean label products, and

331   on the left the original label products (Fig. 4a). The clean label products were

332   associated to positive descriptors as healthy, would buy it/look nice and

333   simple/additive-free; however, the products with original labels were linked to

334   negative descriptors as artificial/processed food, with additives and wouldn't buy

335   it/don't like it (Fig. 4b).

336   The map of vegans and vegetarians also presented two different groups (Fig. 4c),

337   the first one was located in the top of the map and consisted of clean label

338   products. On the left were the clean-label products considered more artificial,

339   processed and meat analogues/replacers, and the products perceived as natural,

340   simple/additive-free and healthy were on the right of the map (Fig. 4d). The

341   second group was formed by original products and was in the bottom of the map.

342 Products on the left were perceive as non-healthy, with additives and with animal

343 ingredients. However, products on the right were perceived as healthy (Fig. 4d).

344 Even if the two groups of consumers represented here were not extremely

345 different in perception, it is interesting to highlight that flexitarian consumers

346 seemed to have given more importance to the category/product usage, further

347 dividing the CL group in two subgroups of meat-analogues (burger, sausages,

348 steak, salami) from the rest.

349

350 **3.3. Attitude questionnaires**

351 **3.3.1. Nutritional knowledge**

352 In order to assess the general nutrition knowledge of the two consumer groups,

353 the correct answers for each section of this questionnaire were collected for each;

354 the results from GNKQ for each section are depicted in Fig. 5. It can be observed

355 that both groups presented, in general, similar knowledge about nutrition, since

356 there were no significant differences between them in any section of the

357 questionnaire ($p > 0.05$) (Fig. 5a). However, when the meat reducers group was

358 further divided into vegans/vegetarians and flexitarians, it can be observed that

359 vegans and vegetarians had a greater significant knowledge about dietary

360 recommendations than flexitarians ($p < 0.05$) (Fig. 5b).

361

362 **3.3.2. Food choice and environmental attitudes**

363 Table 2 shows the mean scores for each item of the FCQ and the factor analysis

364 results performed to detect the load of each item and the relationship with the

365 factor. When assessors were divided into omnivores and other diets group, the

366 item "keeps me healthy" was the most important for both groups. On the other

367   hand, the item "has been produced in a way that animals have not experienced

368   pain" was the least important for omnivores, while and for consumers following

369   other diets was the least important item was "takes me no time to prepare".

370   Moreover, the statistical analysis highlighted significant differences between the

371   food choice motives ($p < 0.05$). People who follow an omnivorous diet indicated

372   a pleasant texture as significantly more important when choosing food than for

373   vegan, vegetarian or flexitarian consumers. In the case of naturalness, vegans,

374   vegetarians and flexitarians thought it was significantly more important than

375   omnivores ("Contains no artificial ingredients"). Moreover, it should be noted that

376   all the items of "Ethical concern/Environmental protection" and "Animal welfare"

377   factors were significantly more important for meat reducer/meat avoiding

378   followers than for omnivores.

379   Further comparing the subgroups within "other diets", depending if they are a

380   meat reducer (flexitarians) or meat/animal products avoiders, in the second part

381   of the Table 3 it can be observed that for vegan/vegetarian consumers the

382   "Animal welfare" factor and the items "has been prepared in an environmentally

383   friendly way", and "has been produced in a way which has not shaken the balance

384   of nature" were significantly more important than for flexitarians.

385   The survey results about health concern and environmentalism are depicted in

386   Table 4. These results showed that other diets consumer group have a higher

387   concern in the natural product interest, since the "I try to eat foods that do not

388   contain additives", "I do not eat processed foods, because I do not what they

389   contain" and "I would like to eat only organically grown vegetables" items were

390   significantly more important to them than to omnivores group ($p < 0.05$).

391   Additionally, they also presented a higher ecological interest in the abuse of the

environment, the plants and animals rights, and the possible ecological catastrophe ($p < 0.05$). However, when this group is divided into vegans/vegetarians and flexitarians it was only observed that all of them think similarly about natural products, but vegan and vegetarian consumers have a higher concern about plants and animals' rights and the earth's limited resources ($p < 0.05$).

4. DISCUSSION

The popularity of plant-based products has been increasing considerably in recent years. However, the results of this study show differences in attitudes, perception and product categorisation depending on the consumer diet (omnivore, flexitarian, vegetarian, vegan). This is in line with recent findings showing that consumers may have different attitudes and motivations depending on the stage of behavioural change towards meat reduction or avoidance (thinking of reducing meat, actually reducing and maintaining that reduction) (Hielkema et al., 2021). More concretely, omnivores in our study separated three groups of plant-based products, based on the category and usage, fried products, products enriched in carbohydrates and the last one as meat analogue products, but clean label and original products were mapped together. However, the meat reducers and avoiders ("other diets") group, perceived plant-based products in a different way, focusing on the clean label status for their categorization. In this case, they perceived the group which contains CL spread food and quinoa with vegetables as healthy, and they use frequency of consumption descriptors to classify them (i.e., frequently for the CL, would not buy for the original products, and occasionally in the middle). It is a well-known fact that meat reducers or

417   avoiders are more concerned about health and sustainability, as can also be

418   observed in the main motivations displayed by this consumer group when

419   answering to the attitude questions. Omnivores did not use any frequency of

420   consumption descriptors, may be because they thought that these kinds of

421   products, in general, were not directed at them, and perhaps they may not like

422   the texture or flavour and they may prefer to consume meat products instead

423   (Lea, Crawford & Worsley, 2006; Fiestas-Flores & Pyhälä, 2018). Additionally,

424   meat-eaters are more resistant to going vegetarian because they perceive

425   vegetarian diets as less tasty, more expensive, less familiar, less convenient, and

426   less healthful (Fiestas-Flores & Pyhälä, 2018; Rosenfeld & Tomiyama, 2020).

427   The meat reducers and avoiders in this study differentiated clean label from

428   original products, perceiving clean label products as more natural and simpler. It

429   can be pointed out that most of "other diets" consumers described products which

430   simulate meat products as "replacer" not as "analogue", this is an important

431   nuance since they perceived these products like an alternative and, with their

432   consumption, they can supply meat products. However, omnivores perceived

433   these products as products that simulate meat or as a "copy-cat" of meat

434   products. Fiestas-Flores & Pyhälä (2018) pointed out that the taste of animal

435   products is the main challenge for Spanish omnivores to choose to reduce or

436   avoid meat from their diet and in that sense, it can be highlighted that Spain has

437   become the country with the largest meat consumption in Europe (Faber et al.,

438   2020). This different categorisation might be explained by the larger importance

439   that meat-reducers give to health and sustainability, and the different degrees of

440   familiarity towards meat analogues. This is interesting, as familiarity (or rather the

441   lack thereof) is one of the big barriers towards meat reduction. Hielkema et al.

442 (2021) confirmed that identity-incongruence (eating foods not familiar or part of

443 their habitual behaviour) inhibits consumers to progress towards meat reduction,

444 and they highlighted that for consumers that were already reducing meat, climate

445 concerns were important drivers, but not for those consumers with no intention to

446 reduce meat.

447 For most consumers, naturalness is crucial to which food industry's answer has

448 been the "clean label" trend (Roman et al, 2017), defined by Ingredion (2014) as

449 *"a 'clean label' positioned on the pack means the product can be positioned as*

450 *'natural', 'organic' and/or 'free from additives/preservatives'."* Our study has

451 shown that consumers may react differently and have a different degree of

452 interest/focus in this trend when categorizing plant-based products. We can

453 confirm that meat-reducers and meat avoiders are more related to this trend,

454 since they pointed out as main reasons for choosing foods that did not contain

455 additives, that were not processed food and that they preferred organically grown

456 vegetables, also, we saw that those consumers categorized clean label products

457 in a different group than the original counterparts. This stronger focus on clean

458 label vs additive added products in the meat reducers and avoider groups, goes

459 in line to what Cliceri et al. (2018) found in their study on attitudes, vegetarian

460 and meat reducers' attitudes towards healthy and natural food products were

461 more positive than omnivores' attitudes. Furthermore, when it comes to

462 veganism, it has been described as "a way of life rather than a simple dietary

463 choice" (North et al., 2021), many times overlaying with other ideology groups

464 (animal activists, environmentalists, focus on social justice), which is also the

465 case for many vegetarians (Rosenfeld & Barrow, 2017) and these groups can be

466 somehow more absolutists in their dietary and lifestyle choices.

467   In general, consumers presented a similar knowledge about nutrition; however,

468   the reasons for choosing food vary according to the diet that each consumer

469   follows. The perception of clean label plant-based products by

470   vegans/vegetarians and flexitarians were quite similar, although flexitarian

471   consumers gave a further division between the CL group separating meat-

472   analogues from the rest. Furthermore, vegans and vegetarians showed a higher

473   concern about dietary recommendations; it could be because vegan/vegetarian

474   consumers need to obtain key nutrients such as zinc, vitamin B12 and protein

475   from alternative sources (Sneijder & te Molder, 2009), so that, they are likely to

476   follow the nutritional recommendations more closer than meat eaters. Thus, the

477   different perception of clean label plant-based products could be related to the

478   attitudes of each consumer diet; commonly, the vegetable and fruit consumption

479   is associated with a healthy dietary pattern and more concern about

480   sustainability. An association between dietary patterns and environmental

481   concern was observed in this study, as results indicated by Asvatourian et al.

482   (2018). Furthermore, our study confirms that reduced-meat diets, vegans and

483   vegetarians, are more motivated by the environmental issues and animal rights

484   than omnivores, in line with that reported by Hopwood, Rosenfeld, Chen and

485   Bleidorn (2021) for vegetarians. Spanish vegan and vegetarians showed having

486   the highest levels of affection towards animals and environmental awareness,

487   while omnivores were least likely to draw similarities between human and non-

488   human animal emotions (Díaz, 2016; Fiestas-Flores & Pyhälä, 2018). Moreover,

489   the ecological drive for vegetarianism has been documented as the most often

490   listed reason. This is based on the fact that meat consumption strongly increases

491   the greenhouse gas emissions, which increase the ecological footprint, as well

492   as the water footprint (De Backer & Hudders, 2014). However, considering the

493   existing literature showing that concerns about animal welfare and environmental

494   impact are the most common reasons for avoiding meat (De Backer & Hudders,

495   2014; Malek, Umberger & Goddard, 2019; Malek & Umberger, 2021), we

496   observed that what distinguished meat reducers from meat avoiders was the

497   importance that they gave to animal welfare factors. Similarly, Fiestas-Flores &

498   Pyhälä (2018) pointed out that human-like animal attributes directly affected

499   Spanish students' intentions to become vegetarian and vegan.

500   Attitudes towards a vegetarian lifestyle have been shown to be significantly

501   correlated with nutritional knowledge (Pribis, Pencak, & Grajales, 2010; Corrin &

502   Papadopoulos, 2017). However, in this study no differences were found between

503   omnivores and other diets group related to healthy patterns, it could be because

504   vegans and vegetarians are more likely to cite ethical motivations over health

505   ones (Rosenfeld, 2018). Thus, the increase of plant-based products in markets

506   (Lantern Study, 2019) may promote the benefits of these ones on sustainability,

507   environment, and animal rights, in addition to health. Both omnivores and meat-

508   reducers and avoiders seem to know well that a meat-reduced diet is positive,

509   since they presented similar nutritional knowledge in our study, as results

510   reported by Asher and Peters (2020). So that, Lea, Crawford and Worsley (2006,

511   p. 835) report that "the primary barrier to eating a vegetarian diet related to taste,

512   whereas taste barriers ranked relatively low in the plant-based diet survey," which

513   is also in line with the results obtained in our study, since omnivores showed that

514   one of the motives for choosing foods is "have a pleasant texture", unlike meat-

515   replacers.

On the other hand, most consumers of this study were young people (<44 years), some of them students with low incomes (Table 1). Fuller, Brown, Rowley and Elliott-Archer (2021) indicated that people who follow a vegan diet are particularly young, females and those living in urban areas. University-educated and younger people may be more receptive to information on changing to a plant-based diet and they appeared to be more willing to alter their diet than the non-university educated and oldest groups (Lea, Crawford & Worsley ,2006). Furthermore, although they present low incomes while they are studying, it is to be expected that they would have high socio-economic status and would take up this form of eating first (Lea, Crawford & Worsley ,2006).

It has been suggested that there is not "one size fits all" with regards to plant-based foods and consumers (Aschemann-Witzel et al., 2020); our study further contributes to the understanding that these two big consumer trends growing in the last years, of plant-based foods and clean-label may interact in different ways with regards to consumer perception and attitudes, which would ultimately affect their choices towards healthier and more sustainable foods.

4.1. Limitations and future research

This study is a first visualization of the interaction of the clean label with the perception of plant-based products by consumers in different stages of meat reduction, avoidance and omnivores, but future research might be performed by focusing on other factors such as gender, age, income and/or diet familiarity, among others, as well as focusing on how taste might influence the effects seen in this work, by including product tasting.

540   It should be noted that this study was performed before the COVID-19 crisis,

541   which has impacted consumer's attitudes and habits in many ways. If this survey

542   were carried out today, the results could be different, since Spanish population

543   during the COVID-19 health crisis has increased its concern for a healthy lifestyle,

544   with an increase of physical activity and fruit and vegetable consumption

545   (Academia Española de Nutrición y Dietética, 2020; López-Bueno et al., 2020).

546   It could be related to the families had more time to cook and improve eating

547   habits, even though this did not increase the overall diet quality of Spanish

548   population (Ruiz-Roso et al., 2020).

549   This study represents a sample of Spanish consumers; so these results may be

550   different in other cultural contexts and environments settings (Ares, 2018).

551

552   **4. CONCLUSIONS**

553   Consumer categorisation and perception of clean label plant-based products was

554   different depending on the type of diet. The present results show that flexitarian,

555   vegetarian and vegan consumers pay more attention to food naturalness quality

556   and health, following the clean label trend, as compared to omnivorous

557   consumers. At the same time, this group also presents a greater concern for

558   animal welfare and sustainability. Clean label plant-based products were

559   perceived as healthy, simple/additive-free, natural, and would buy it/look nice by

560   meat reducers and avoiders, while omnivores did not focus on the clean label

561   status when categorizing plant-based products.

562   We hereby present a first exploration of consumers' categorisation and

563   perception of clean label plant-based products, and its relation to consumer

564   attitudes, depending on their diet, and it can help to the understanding of how

565 different consumers perceive them, at the light of supporting consumers in a
566 transition to healthier, more sustainable diets.

567

567

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Figure captions

Fig. 1. Example of experimental card, (a) original label and (b) clean label (CL).

Fig. 2. Perceptual space determined by the first two factors of the MFA in the projective mapping task by **omnivores**. (a) Representation of the samples and (b) representation of the terms obtained in the descriptive step. Note: CL before the food product name means "clean-label".

Fig. 3. Perceptual space determined by the first two factors of the MFA in the projective mapping task by consumers of **"other diets"** (vegetarian, vegan and flexitarian). (a) Representation of the samples and (b) representation of the terms obtained in the descriptive step. Note: CL before the food product name means "clean-label".

Fig. 4. Perceptual space determined by the first two factors of the MFA in the projective mapping task by flexitarians and vegans/vegetarians. (a) Samples' representation by flexitarians; (b) representation of terms obtained by flexitarians; (c) samples' representation by vegans/vegetarians; (d) representation of terms obtained by vegans/vegetarians.

Fig. 5. GNQK correct answers for each section: (a) differences between omnivores and "other diets" group and (b) differences between flexitarians and vegans/vegetarians.

a) 309

MEATBALLS. INGREDIENTS: Water, **wheat gluten, seitan** (18.2%), sunflower oil, fried tomato (tomato, olive oil, onion, leek, cane sugar, salt, garlic, acidifier: citric acid E330), **tofu** (9.1%) (water, **soybeans**, coagulant: calcium sulfate E516), **almond**, onion, brewer's yeast (contains **wheat**), spices (contains **celery**), sea salt, apple cider vinegar, cornstarch, garlic, sauce **soybean** (contains **wheat**), thickeners: xanthan gum E415 and carrageenan E407; parsley, emulsifier: **soy** lecithin E322. Breaded: breadcrumbs (contains **wheat**), **soy** drink.

b) 523

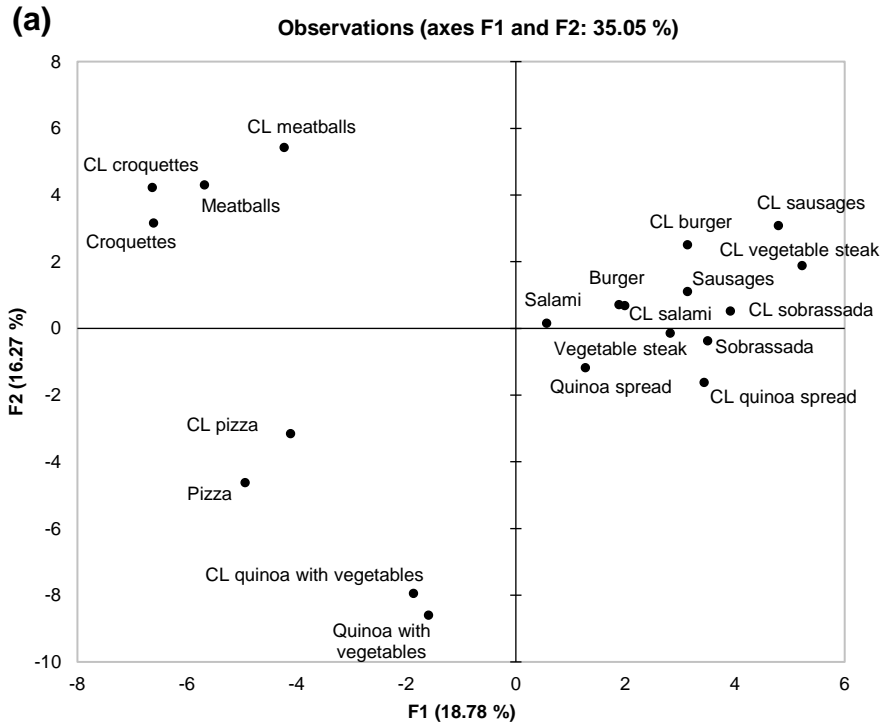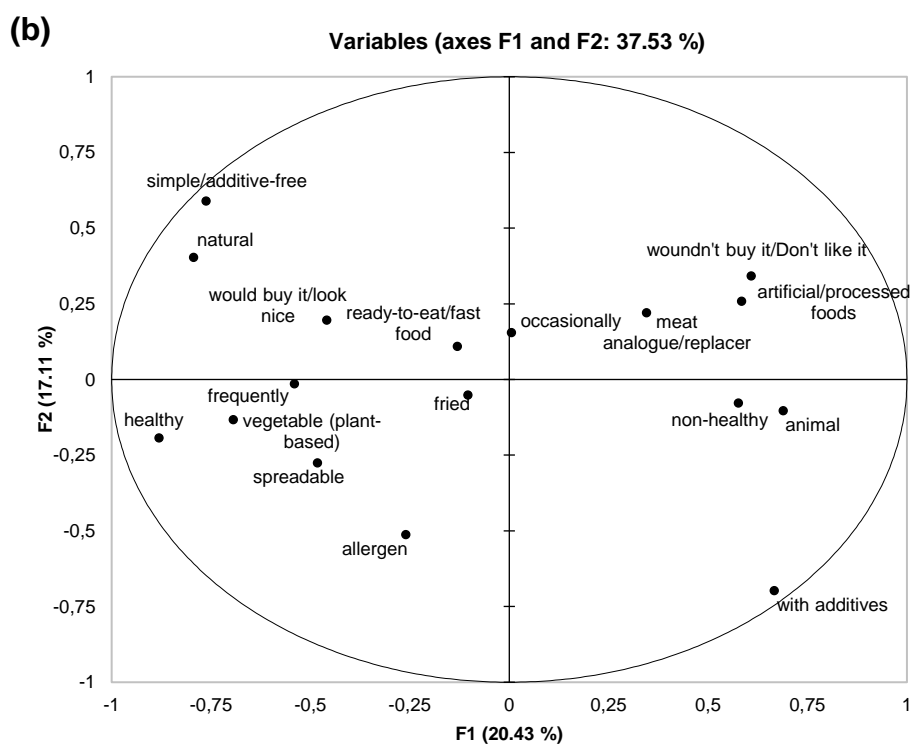MEATBALLS. INGREDIENTS: Water, buckwheat protein, sunflower oil, fried tomato (tomato, olive oil, onion, leek, cane sugar, salt, garlic, lemon extract), *Plantago psyllium* preparation (water, Plantago fibre (6%)) (9.1%), onion, gluten-free brewer's yeast, spices, sea salt, apple cider vinegar, cornstarch, garlic, pea fibre, parsley, potato protein. Breaded: gluten-free breadcrumbs, rice drink.

Fig. 1.

(a)

Observations (axes F1 and F2: 35.05 %)

F2 (16.27 %)

CL meatballs

CL croquettes

Meatballs

Croquettes

CL sausages

CL burger

CL vegetable steak

Burger   Sausages

Salami   CL salami   CL sobrassada

Vegetable steak   Sobrassada

Quinoa spread   CL quinoa spread

CL pizza

Pizza

CL quinoa with vegetables

Quinoa with vegetables

F1 (18.78 %)

(b)

Variables (axes F1 and F2: 35.05 %)

F2 (16.27 %)

fried
breaded

meat analogue

gluten

natural   necessary to heat   cold cut

allergen   simple/additive-free

with additives   spreadable

artificial/processed foods

ready-to-eat

carbohydrates

vegetable (plant-based)

healthy

F1 (18.78 %)

Fig. 2.

(a)

Observations (axes F1 and F2: 37.53 %)

(b)

Variables (axes F1 and F2: 37.53 %)

Fig. 3.

Fig. 4.

Fig. 5.

Table 1. Socio-demographic information of 101 respondents.

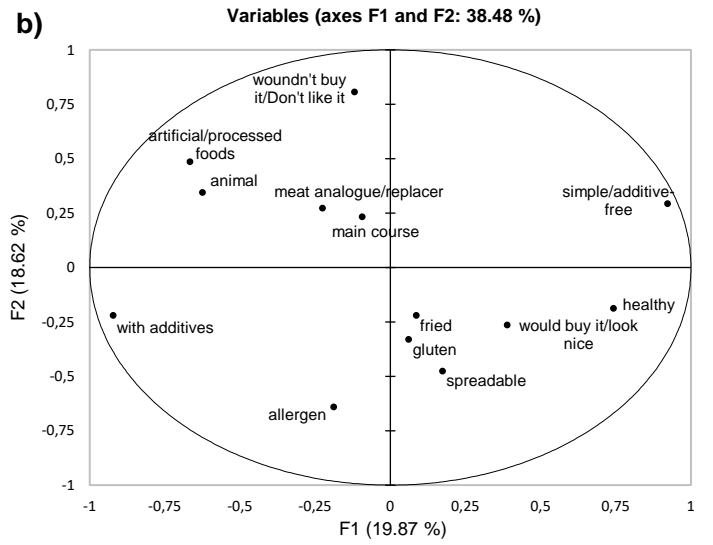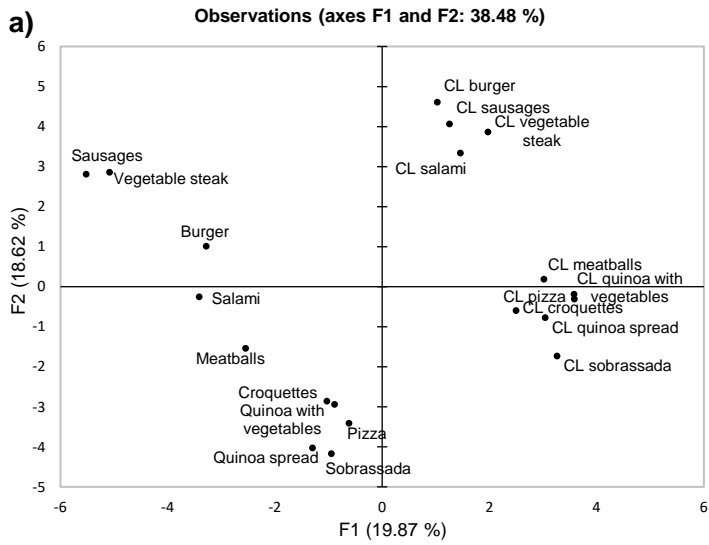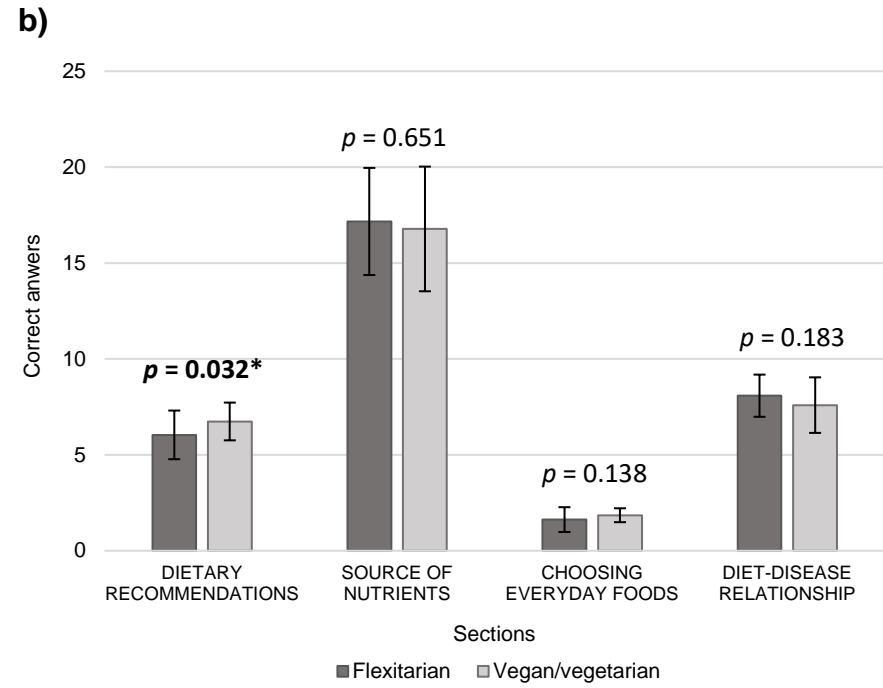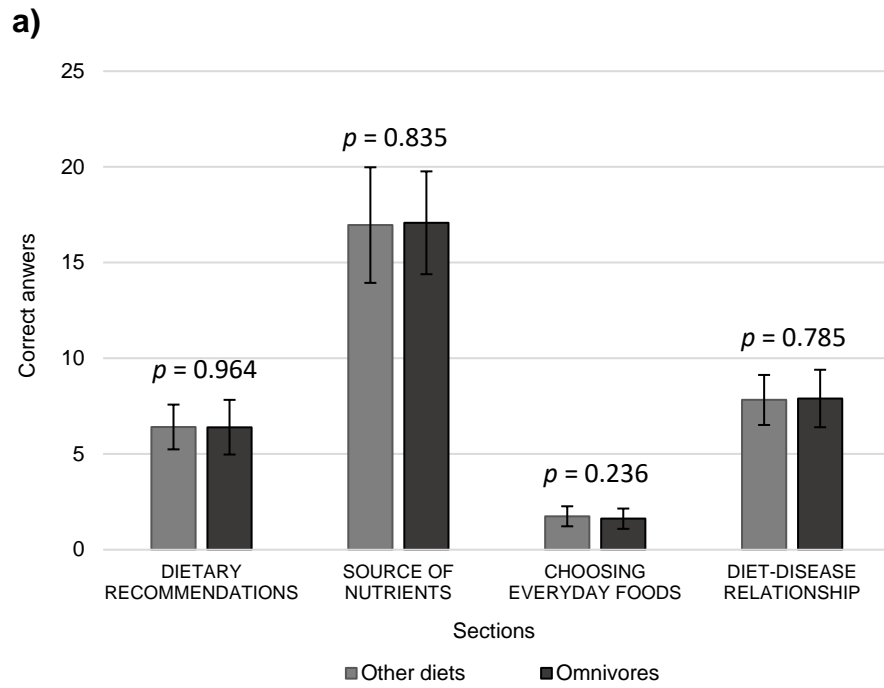| Socio-demographic information	Number of respondents	Percentage
Gender		
Male	32	31.68%
Female	68	67.33%
I prefer not to say	1	0.99%
Age		
18-24	27	26.73%
25-34	58	57.43%
35-44	10	9.90%
45-54	3	2.97%
55-64	3	2.97%
Education level		
Secondary school	9	8.91%
Professional training	9	8.91%
Degree	42	41.58%
Master	26	25.74%
Doctorate	14	13.86%
I prefer not to say	1	0.99%
Country		
Spain	82	81.19%
Europe	10	9.90%
Latin America	9	8.91%
Diet		
Vegetarian	13	12.87%
Vegan	14	13.86%
Omnivorous	50	49.50%
Flexitarian	24	23.76%
Employment status		
Student	47	46.53%
Unemployed	3	2.97%
Employed Part-time	9	8.91%
Employed Full-time	29	28.71%
Public worker	12	11.88%
Retired	1	0.99%
Salary		
< 500	26	25.74%
500-1000	23	22.77%
1000-1500	22	21.78%
1500-2000	21	20.79%
2000-2500	5	4.95%
I prefer not to say	4	3.96%
Live status		
Alone	14	13.86%
In couple	29	28.71%
With family	36	35.64%
Sharing floor	22	21.78%

Table S1. Original and Clean labels of selected products.

Products	Original Label	Clean Label
Sausages	**Egg white powder** (rehydrated), water, sunflower oil, salt, aromatic plants, spices, flavourings, glucose syrup, dextrose, stabilizers: carrageenan E407, garrofin gum E410, xanthan gum E415, Konjac gum E425; acidity correctors: sodium acetate E262, Lactic acid E270; carrot powder, colours: radish concentrate, carotene E160a.	Potato protein (rehydrated), water, sunflower oil, salt, aromatic plants, spices, aromas, glucose syrup, dextrose, Plantago fibre (*Plantago psyllium*), lemon juice, alcohol vinegar, carrot powder, radish concentrate.
Burger	Water, pea protein (18%), **rapeseed oil**, refined coconut oil, aroma, smoke aroma, stabilizers: cellulose E460, methylcellulose E461, gum Arabic E414; potato starch, maltodextrin, yeast extract, salt, sunflower oil, dehydrated yeast, antioxidants: ascorbic acid E300, acetic acid E260; colour: beet juice concentrate E162; modified starch, apple extract, lemon juice concentrate.	Water, pea protein (18%), sunflower oil, refined coconut oil, aroma, smoke aroma, Plantago fibre (*Plantago psyllium*) and pea fibre, potato starch, maltodextrin, yeast extract, salt, sunflower oil, lemon extract, beetroot juice, modified starch, apple extract, lemon juice concentrate.
Vegetable steak	**Rehydrated egg white**, water, sunflower vegetable oil, salt, vegetable fibre, aromatic plants (0.6%), spices, spice extracts, flavourings, sugar, dextrose, thickeners: carrageenan E407, garrofin gum E410, xanthan gum E415; acidity correctors: sodium acetate E262, Lactic acid E270, potassium lactate E326, potassium chloride E508; food colour: radish, apple and blackcurrant concentrate; olives.	Rehydrated potato protein, water, sunflower vegetable oil, salt, aromatic plants (0.6%), spices, spice extracts, aromas, sugar, dextrose, Plantago fibre (*Plantago psyllium*), potato fibre, lemon juice, yeast extract, radish concentrate, apple and blackcurrant; olives.
Salami	Water, canola oil, stabilisers: garrofin gum E410, xanthan gum E415; **wheat gluten** (4.4%), pea proteins (2.7%), spices, maltodextrin, dextrose, sea salt, vinegar, beet concentrate, colour: paprika extract E160c; tomato concentrate, acidity regulator: calcium citrate E333.	Water, sunflower oil, potato fibre, buckwheat protein (4.4%), pea protein (2.7%), spices, maltodextrin, dextrose, sea salt, vinegar, red beet concentrate, paprika, tomato concentrate, vinegar extract.
Croquettes	**Soy drink**, spinach (20.1%), **breaded** (breadcrumbs [**contains wheat**], water, **wheat flour**, corn starch), **wheat flour**, **tofu** (7%) (water, **soybeans**, stabilizer: calcium sulphate E516), margarine, **pine nuts**, raisins, sea salt.	Rice drink, spinach (20.1%), **breaded** (breadcrumbs [contains wheat], water, **wheat flour**, corn starch), **wheat flour**, prepared from *Plantago psyllium* (water, Plantago fibre (6%)), margarine, **pine nuts**, raisins, sea salt.
Meatballs	Water, **wheat gluten**, **seitan** (18.2%), sunflower oil, fried tomato (tomato, olive oil, onion, leek, cane sugar, salt, garlic, acid: citric acid E330), **tofu** (9.1%) (water, **soybeans**, coagulant: calcium sulphate E516), **almond**, onion, **brewer's yeast (contains wheat)**, **spices (contains celery)**, sea salt, apple vinegar, corn starch, garlic, **soy sauce (contains wheat)**, thickeners: xanthan gum E415 and carrageenan E407; parsley, emulsifier: soy lecithin E322. Breading: **breadcrumbs (contains wheat), soy milk.**	Water, buckwheat protein, sunflower oil, fried tomato (tomato, olive oil, onion, leek, cane sugar, salt, garlic, lemon extract), prepared *Plantago psyllium* (water, Plantago fibre (6%)) (9.1%), onion, gluten-free brewer's yeast, spices, sea salt, apple vinegar, corn starch, garlic, pea fibre, parsley, potato protein. Breading: gluten-free breadcrumbs, rice milk.
Quinoa spread	Water, **tofu** (water, **soybeans**, gelling agent: E511 magnesium chloride), sunflower oil, kale (10.3%), quinoa (4.3%), potato starch, onion, **celery**, potato powder, sea salt, agave syrup, lemon juice, garlic, herb mixture (0.67%), thyme (0.18%).	Water, **cashews**, sunflower oil, kale (10.3%), quinoa (4.3%), potato starch, onion, potato powder, sea salt, agave syrup, lemon juice, garlic, herb mixture (0.67%), thyme (0.18%).

Sobrassada	**Cashews** (33.7%), sunflower seeds (11.2%), sunflower oil, extra virgin olive oil (6%), miso (barley and **soybean**), paprika, salt and xanthan gum E415.	**Cashews** (33.7%), sunflower seeds (11.2%), sunflower oil, extra virgin olive oil (6%), miso (barley and **soybean**), paprika, salt and potato fibre.
Pizza	**Common wheat flour**, prepared natural strips (11%) [water, **soy protein concentrate**, sunflower oil, salt, aroma, spices (paprika, pepper, ginger, nutmeg, cardamom)], tomato sauce, tomato pulp, vegetable preparation (10%) (water, modified corn and potato starch, coconut oil, vegetable protein, salt, vegetable fibre, flavouring, stabilizer: tara gum E417; colour: calcium carbonate E170, b-carotene E160a; preservative: sorbic acid E200; vitamin B12), water, semi-dehydrated tomato (7.5%), rucola (2.5%), sunflower seed oil, extra virgin olive oil, salt, seasoned breadcrumbs [breadcrumbs (**wheat flour, malted wheat flour**, **rapeseed oil**, sunflower seed oil, yeast, dextrose, salt), extra virgin olive oil, onion, garlic, rosemary, parsley, thyme, salt, black olives], yeast, sugar, olive oil, thyme, garlic, onion, parsley, oregano, black pepper and basil.	**Common wheat flour**, prepared natural strips (11%) [water, pea protein concentrate, sunflower oil, salt, aroma, spices (paprika, pepper, ginger, nutmeg, cardamom)], tomato sauce, tomato pulp, vegetable preparation (10%) [(water, modified corn and potato starch, coconut oil, vegetable protein, salt, plantain vegetable fibre (*Plantago psyllium*) and potato, yeast extract, paprika, fermented dextrose, vitamin B12), water, semi-dehydrated tomato (7.5%), rucola (2.5%), sunflower seed oil, extra virgin olive oil, salt, onion, garlic, rosemary, parsley, thyme, salt, black olives], yeast, sugar, olive oil, thyme, garlic, onion, parsley, oregano, black pepper and basil.
Quinoa with vegetables	Cooked red bean, real quinoa (14%), water, tomato, corn, extra virgin olive oil, onion, red pepper, green pepper, lemon juice, vinegar, salt, brown sugar, spices and stabilizer: xanthan gum E415.	Cooked red bean, real quinoa (14%), water, tomato, corn, extra virgin olive oil, onion, red pepper, green pepper, lemon juice, vinegar, salt, brown sugar, spices and citrus fibre.

Table 2. FCQ-items means, standard deviations (SD), factor loading and *p-value* for answer to: "*It is important to me that the food I eat on a typical day*" for each experimental group.

Factors and items	Omnivores	Factor loading	Other diets	Factor loading	*p-value*	Vegans/Vegetarians	Factor loading	Flexitarians	Factor loading	*p-value*
	Mean (SD)		Mean (SD)			Mean (SD)		Mean (SD)		
Factor 1. Health										
Keeps me healthy	6.38 (0.78)	0.442	6.47 (0.73)	0.616	0.548	6.59 (0.69)	0.589	6.33 (0.76)	0.578	0.209
Is high in protein	4.80 (1.41)	0.415	4.84 (1.27)	0.268	0.872	5.11 (0.89)	0.270	4.54 (1.56)	0.312	0.124
Is high in fibre and roughage	4.66 (1.29)	0.505	5.02 (1.27)	0.435	0.161	5.04 (1.02)	0.623	5.00 (1.53)	0.474	0.921
Factor 2. Mood										
Helps me to cope with life	5.52 (1.39)	0.330	5.90 (1.30)	0.388	0.157	5.93 (1.44)	0.189	5.88 (1.15)	0.573	0.891
Makes me feel good	6.22 (1.27)	0.391	6.33 (0.93)	0.496	0.609	6.33 (1.00)	0.364	6.33 (0.87)	0.574	1.000
Factor 3. Convenience										
Is easy to prepare	4.88 (1.76)	0.707	4.76 (1.56)	0.661	0.728	**5.19** (1.39)	0.566	4.29 (1.63)	0.733	**0.039***
Is easily available in shops and supermarkets	5.70 (1.27)	0.605	5.55 (1.32)	0.426	0.558	5.82 (1.15)	0.686	5.25 (1.45)	0.416	0.127
Takes me no time to prepare	4.72 (1.62)	0.633	4.65 (1.65)	0.693	0.823	4.89 (1.53)	0.546	4.38 (1.77)	0.764	0.270
Factor 4. Sensory appeal										
Has a pleasant texture	**6.06** (1.08)	-0.038	5.35 (1.43)	0.654	**0.006***	5.22 (1.70)	0.621	5.50 (1.06)	0.577	0.482
Looks nice	5.44 (1.25)	0.222	5.00 (1.39)	0.740	0.097	4.96 (1.45)	0.600	5.04 (1.33)	0.675	0.842
Factor 5. Natural content										
Contains no additives	4.32 (1.76)	0.511	4.90 (1.63)	0.377	0.087	4.89 (1.78)	0.441	4.92 (1.47)	0.625	0.952
Contains natural ingredients	5.60 (1.21)	0.560	5.98 (1.10)	0.399	0.102	6.00 (1.24)	0.597	5.96 (0.96)	0.637	0.895
Contains no artificial ingredients	4.64 (1.71)	0.573	**5.51** (1.29)	0.416	**0.005***	5.52 (1.28)	0.761	5.50 (1.32)	0.692	0.960
Factor 6. Price										
Is not expensive	4.76 (1.60)	0.649	5.25 (1.34)	0.617	0.095	5.41 (1.42)	0.541	5.08 (1.25)	0.598	0.394
Is good value for money	5.84 (1.22)	0.722	5.92 (0.98)	0.279	0.711	5.85 (1.03)	0.513	6.00 (0.93)	0.268	0.594
Factor 7. Ethical concern/Environmental protection										
Is packaged in an environmentally friendly way	5.14 (1.47)	0.710	**6.00** (1.15)	0.752	**0.001***	6.26 (1.06)	0.744	5.71 (1.20)	0.665	0.087
Has been prepared in an environmentally friendly way [a]	5.16 (1.49)	0.815	**6.10** (1.22)	0.840	**0.001***	**6.56** (0.85)	0.786	5.58 (1.38)	0.856	**0.005***
Has been produced in a way which has not shaken the balance of nature [a]	4.98 (1.45)	0.905	**5.86** (1.22)	0.874	**0.001***	**6.33** (0.92)	0.796	5.33 (1.31)	0.864	**0.003***
Factor 8. Animal welfare										
Has been produced in a way that animals have not experienced pain [a]	4.51 (1.92)	0.636	**6.02** (1.53)	0.569	**<0.0001***	**6.85** (0.46)	0.483	5.08 (1.77)	0.478	**<0.0001***
Has been produced in a way that animals' rights have been respected [a]	4.84 (1.49)	0.780	**6.24** (1.09)	0.751	**<0.0001***	**6.74** (0.66)	0.576	5.67 (1.20)	0.793	**0.000***

Mean values in bold type correspond to the highest mean for each factor.
* indicates significant differences at *p*-value < 0.05
[a] Items from Lindeman and Väänänen (2000).

Table 3. Natural products interest and NEP-items means, standard deviations (SD), factor loading and *p-value* for each experimental group.

Factors and items	Omnivores Mean (SD)	Factor loading	Other diets Mean (SD)	Factor loading	*p-value*	Vegans/Vegetarians Mean (SD)	Factor loading	Flexitarians Mean (SD)	Factor loading	*p-value*
Natural product interest [a]										
I try to eat foods that do not contain additives	4.14 (1.90)	0.851	**5.12** (1.76)	0.848	**0.008***	5.33 (1.86)	0.853	4.88 (1.65)	-0.856	0.359
I do not care about additives in my daily diet	3.28 (1.59)	-0.593	2.92 (1.86)	-0.824	0.302	3.15 (1.96)	-0.687	2.67 (1.76)	0.885	0.362
I do not eat processed foods, because I do not what they contain	2.80 (1.65)	0.474	**3.57** (1.60)	0.411	**0.020***	3.59 (1.53)	0.776	3.54 (1.72)	-0.398	0.911
I would like to eat only organically grown vegetables	3.66 (1.94)	0.536	**5.02** (1.88)	0.750	**0.001***	5.37 (1.80)	0.848	4.63 (1.93)	-0.697	0.160
In my opinion, artificially flavoured foods are nor harmful for my health	3.30 (1.91)	-0.738	3.00 (2.05)	-0.635	0.448	3.04 (2.21)	-0.752	2.96 (1.90)	0.471	0.893
In my opinion, organically grown foods are no better for my health than those grown conventionally	3.96 (1.91)	-0.629	3.26 (2.08)	-0.728	0.079	3.56 (2.34)	-0.791	2.92 (1.72)	0.751	0.277
New Ecological Paradigm scale [b]										
Humans are severely abusing the environment	6.58 (0.86)	0.657	**6.88** (0.43)	0.663	**0.027***	6.96 (0.19)	0.280	6.79 (0.59)	0.723	0.184
The earth has plenty of natural resources if we just learn how to develop them	5.98 (1.29)	0.215	5.98 (1.46)	0.549	0.999	5.89 (1.58)	0.538	6.08 (1.35)	0.670	0.640
Plants and animals have as much right as human to exist	5.64 (1.61)	0.559	**6.35** (1.47)	0.502	**0.022***	**6.78** (0.64)	0.176	5.88 (1.94)	0.346	**0.038***
The so-called "ecological crisis" facing humankind has been greatly exaggerated	2.88 (1.69)	0.222	2.41 (1.97)	-0.308	0.203	2.48 (2.10)	-0.319	2.33 (1.86)	0.346	0.792
The earth is like a spaceship with very limited rooms and resources	5.76 (1.62)	0.693	5.49 (2.10)	0.507	0.473	**6.04** (1.74)	0.619	4.88 (2.33)	0.680	**0.048***
If thing continue on their present course, we will soon experience a major ecological catastrophe	5.74 (1.60)	0.753	**6.41** (0.85)	0.703	**0.010***	6.48 (0.75)	0.753	6.33 (0.96)	0.666	0.541

Mean values in bold type correspond to the highest mean for each factor.
* indicates significant differences at *p*-value < 0.05
[a] Factor and items from Roininen, Lähteenmäki and Tuorila (1999).
[b] Items from Dunlap, Van Liere, Mertig and Jones (2000).