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Ecolabels as Heuristic Cues: Exploring the Role of Ecolabels in Food Attribute Inferences

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ABSTRACT

This study presents a novel approach by examining the role of environmental labels (e.g., ecolabels) as heuristic cues in consumer inferences, beyond their traditional informational function. The research evaluated the influence of the presence, number, and type (real or fake) of ecolabels on consumer inferences of an extra virgin olive oil product through a between-subjects experiment involving 720 participants in Spain. The methodology was designed to minimize common biases by exposing each participant to only one stimulus and employing real product labels and packaging with controlled modifications (including both the quantity and type of seal, real and fake). Using various multivariate analyses of covariance (MANCOVA), the study sequentially explored a set of research questions regarding the impact of the number of ecolabels and their potential interchangeability across seven distinct product dimensions. The findings reveal that ecolabels do not significantly enhance overall product evaluations, except in two dimensions associated with human-related attributes—commitment to quality and producer honesty—which are more closely linked to the generic certification process than to the specific meaning of each label. No linear relationship or optimal number of labels was identified, and no significant differences were found between real and fake ecolabels. The results suggest that ecolabels function primarily as generic heuristic cues with limited influence, particularly when the product's presentation is visually appealing.

1 | Introduction

The consumption of sustainable products essentially depends on two factors: a well-informed and engaged public, with values, knowledge, and beliefs about the impacts of consumption, as well as trust in certification processes (Nagar and Verma 2025; Popowicz et al. 2025; Vega-Zamora et al. 2019); and the inclusion of clear packaging signals that enable consumers to recognize sustainable products and understand the implications of their production and consumption, that is, to interpret the meaning of these signals.

The first dimension is psychographic and cultural and is related to how people's mindsets evolve through factors such as perceived problems, interests, values, knowledge, and awareness of behavioral impacts. Social influences, communication efforts, and awareness campaigns shape this dimension. Producers use packaging signals to inform and build trust with consumers in the most concise and effective ways possible. Common examples are environmental seals and logos (hereafter referred to as "ecolabels"), which, through symbols or icons, aim to convey substantial information and trust regarding the product, its production process, and the values of those who produce and sell it. These labels offer consumers a way to consider the ethical aspects of production processes they may otherwise overlook, undervalue, and/or be uncertain about (Grunert et al. 2014).

For producers, obtaining these seals and certifications involves costs, which can be justified to the extent that they help differentiate the product/brand and improve consumers' evaluations.

These seals/certifications are assumed to have the potential to influence consumers' purchase intentions (de Magistris and Gracia 2016; Ertz et al. 2017; Potter et al. 2021; Rossi and Rivetti 2020; Vecchio and Annunziata 2015).

Many authors have suggested that the effectiveness of ecolabels is closely tied to the extent that consumers recognize, understand, and trust them, and to the extent they find them valuable and aligned with their own values (e.g., Brach et al. 2018; Darnall et al. 2018; Grunert et al. 2014; Moroșan et al. 2025; Nagar and Verma 2025; Sirieix et al. 2013; D'Souza et al. 2021). In this regard, Luick et al. (2025) highlighted that consumers' trust in ecolabels is strongly influenced by the perceived clarity and legitimacy of these labels, underscoring the importance of making them easily recognizable and understandable to consumers. However, cultivating positive beliefs about and attitudes toward ecolabels is challenging, given the sheer variety and potential confusion surrounding them (Judijanto et al. 2025). On www.ecolabelindex.com, 456 different ecolabels from 199 countries are listed—and their prevalence is increasing, with the number of products displaying them growing by 2.83% each year (Nes et al. 2024). This proliferation of ecolabels and pseudo-labels generates confusion and skepticism among consumers (Carmona 2011; Nagar and Verma 2025; Zaman et al. 2010). This issue is particularly evident in markets such as Australia, where Burstow et al. (2025) found that consumers perceive grocery shopping as a routine task and rely on heuristic shortcuts such as brand and price rather than paying attention to ecolabels. The research revealed that due to confusion and skepticism about the reliability of these labels, their influence on dairy product purchase decisions was limited. This raises the question of whether consumers may ultimately become insensitive to ecolabels because of their sheer quantity and stop making the effort to learn what they mean and stop paying attention to them. This issue prompts a deeper exploration of the role of ecolabels in the marketplace and how consumers interpret and use them. To address these questions, this work focuses on the potential role of ecolabels as heuristic cues rather than examining only their cognitive aspects. Specifically, this study aims to explore whether consumers use ecolabels to make inferences about product characteristics and evaluations within a food-shopping context. In this context, purchasing decisions are quick and superficial, with heuristic decision-making prevailing over cognitive processing (Moser 2016). The proposal is that consumers consider dimensions other than quality—such as naturalness, tradition, sustainability, healthiness, social responsibility, and brand honesty—that are not directly observable, and that their inferences about these attributes may depend on the quantity and type of ecolabels presented.

In summary, the main novelty/contribution of this work lies in adopting a radically different approach based on the heuristic processing of ecolabels. It analyzes whether consumers, through these cues, infer dimensions that go beyond those traditionally studied in the ecolabel literature. In this regard, the variables most commonly examined in the ecolabel literature are: willingness to pay (e.g., Budhathoki et al. 2025; Maesano et al. 2020; Sigurdsson et al. 2022), purchase intention (e.g., Potter et al. 2021; Potter et al. 2022), and, to a lesser extent, some quality perceptions (Dekhili and Ertz 2024). Furthermore, within the heuristic approach, an important innovation is the distinction made between generic and specific cues, which allows for a critical point to be focused on: do consumers recognize the specific ecolabels available in the market, or do they, instead, process the ecolabel in a generic way without paying attention to its meaning? To address this issue, we compare real and fake ecolabels. Additionally, we provide some methodological suggestions based on the heuristic approach to help avoid many of the biases commonly found in product attribute research in general.

To explore how ecolabels influence consumer inferences—that is, their role as a heuristic cue—we developed a sequence of research questions to progressively deepen our understanding of this objective. By comparing responses to a set of scales related to different product attributes, we aimed to address whether there are differences between including or not including ecolabels, whether there is a linear relationship between the number of ecolabels and product evaluations and inferences, whether there is an optimal number of ecolabels, and whether they function as generic or specific cues—in other words, whether there are differences between real and fake ecolabels. To address these questions, we conducted an experiment specifically designed to avoid influencing consumer responses, mainly by avoiding clues about the study's purpose and by presenting ecolabels alongside the real information that typically accompanies a product. The entire study is structured into a theoretical framework focusing on previous literature on ecolabels and heuristic processing, a Methodology section describing the experiment, a Results section organized according to the four research questions, a Discussion section that also includes the study's social, business, and methodological implications, as well as its limitations, and finally, a Conclusion section.

2 | Literature Review

The ecolabel-focused literature is extensive and relatively complex and has produced a range of heterogeneous findings. Several comprehensive review papers have examined ecolabels, sustainability claims and other seals/signals, both in general (Bangsa and Schlegelmilch 2020; Nagar and Verma 2025) and for specific products—for example, Erraach et al. (2021) on olive oils. In addition, some reviews have focused exclusively on ecolabels (Abdu and Mutuku 2021; Bastounis et al. 2021) and in evaluating their methodologies (Roesch et al. 2025). Overall, the literature suggests that outcomes are largely *context-referent*, that is, they vary according to the methodology used, the specific product studied, the seals and claims examined, consumer familiarity with the labels, the country/market, brand characteristics, price, and nutritional information. Judijanto et al. (2025) support this idea by concluding that the effectiveness of green labels "is contingent on factors such as label credibility, standardization, and consumer education." Their bibliometric analysis synthesized the contextual variability in green label research, highlighting consumer knowledge and environmental concerns as key drivers of perceived value. Similarly, Roesch et al. (2025) identified that heterogeneity in findings also stems from underlying methodological issues, such as the use of different methods and subjectivity in decision-making, which can undermine the credibility and transparency of ecolabels. It has also

been shown that consumer-related variables such as knowledge, environmental concerns, education level and trust in the seals play a significant role (Kovač et al. 2025; Nagar and Verma 2025; Popowicz et al. 2025; Rossi and Rivetti 2023). In this vein, Aminravan et al. (2025) delves into the differences in willingness to pay for eco-labeled fruits and vegetables in short supply chains versus export-oriented chains, highlighting the key role of trust in certifications, interest in information, and environmental concerns as contextual drivers of perceived value.

This contextual variability underlines the idiographic nature of the research, making it challenging to identify converging points and generalize across findings. At a broad level, the main results have indicated that ecolabels generally enhance consumers' product evaluations (Abdu and Mutuku 2021; Bastounis et al. 2021; Del Giudice et al. 2015; Uchida et al. 2014; Hoek et al. 2013). However, this effectiveness is not universal. While some systematic reviews have suggested that sustainability labels have a positive impact, they also emphasize the need for more field studies to identify better options, as most research has been conducted under hypothetical conditions. In line with this need, Luick et al. (2025) conducted a randomized controlled trial in workplace cafeterias and found no evidence that ecolabels reduced the environmental impact of the meals sold. Consistent patterns also emerge; for example, ecolabels seem to have a reduced impact on consumer perceptions as brand strength increases (Larceneux et al. 2012; Bauer et al. 2013; Burstow et al. 2025; Janssen and Hamm 2012; De Pelsmacker et al. 2005; Sirieix et al. 2013).

Some studies have examined ecolabels alongside other types of labels and claims to understand the isolated and combined effects of these signals on consumers' evaluations. In these cases, the results vary based on the specific combination of signal, product, and market. For instance, some studies have suggested that ecolabels have a strong impact (Del Giudice et al. 2015; Giannoccaro et al. 2019; Erraach et al. 2017), while others have found them to be less influential than other certifications/signals (Loureiro and Lotade 2005; Remaud et al. 2008; Yangui et al. 2016; Bernard et al. 2006). This has been observed often in some countries when ecolabels are compared with certifications of origin (Del Giudice et al. 2015). In addition, the relative importance of these claims and certifications is influenced by consumer type/profile (e.g., Tempesta and Vecchiato 2019), and whether the studies are conducted in developed countries (Thøgersen et al. 2019). Recent studies have also examined ecolabels alongside the Nutri-Score front-of-package label. Berden and Hung (2025) show that the Eco-Score improves the accuracy of environmental impact assessments when presented together with Nutri-Score, although the effects are less pronounced when the scores are conflicting, which may lead to cognitive dissonance. Similarly, Dervishi and Dohle (2025) found that while Nutri-Score and Eco-Score labels enhance perceptions of healthiness and sustainability, their effects on dimensions such as taste and willingness to buy were limited, especially when products had brands that exerted a stronger influence on purchase decisions than the labels themselves.

In general, multi-label studies suggest that results depend on: whether consumers perceive labels as being complementary (super-additive effects, where the joint effect is greater than the sum of individual effects), or substitutive (sub-additive effects)—see Meas et al. (2015) and Gracia et al. (2014).

Finally, few studies have focused exclusively on the question of whether using multiple ecolabels increases consumers' perceptions of the value of foods, and those that did produced mixed results. Tebbe and von Blanckenburg (2018) found that adding more ecolabels has minimal effect, while Janßen and Langen (2017) suggested that additive effects, positive or negative, depend on the market segment. Janssen and Hamm (2012) found that displaying two ecolabels together had a positive outcome, while Sirieix et al. (2013) suggested that using two labels is beneficial only when consumers perceive them as complementary; in addition, certain combinations of label can have negative effects if consumers see them as contradictory. Dufeu et al. (2014) reported that adding seals (ranging from 1 to 3) produces positive, but diminishing, effects as the quantity increases. Similarly, Zhu et al. (2023) observed that increasing the quantity of ecolabels had diminishing cumulative effects. On the other hand, according to Moon et al. (2016), the confusion caused by ecolabel overload, their similarity, and ambiguity can lead to negative emotions, distrust, and dissatisfaction among consumers.

In general, it can be observed that findings may be influenced by the study methodology used. Most studies measure the effect of ecolabels using willingness to pay (WTP) as the primary outcome variable (as a summary of consumer behavior). There is also a growing trend towards using multi-stimulus methods—such as conjoint analysis, auction methods, and particularly, choice experiments (Bangsa and Schlegelmilch 2020)—where participants rank, select, and assign prices to different product options. These options include the same product with the variations under study, such as different seals, seal combinations, and claims.

Despite their popularity, these methods often overestimate the importance of certain attributes, largely because consumers tend to infer the study's purpose. Participants are typically presented with multiple product options that feature ecolabels and other prominent stimuli, which allow them quickly to identify the study's objective by comparing the options. This process increases the *salience*—prominence, capturing attention (Taylor and Fiske 1978)—and the positive *valence* of ecolabels. Consequently, these methods are particularly prone to biases, such as social desirability and politeness (Furnham 1986; Podsakoff et al. 2003; Tourangeau et al. 2000). Sequentially exposing subjects to combinations of attributes closely resembles within-subject designs, which, as noted by Nobel laureate Daniel Kahneman (2003), "in studies of intuition (...) are liable to induce the effect that they are intended to test" (Kahneman and Tversky 1982, 500). Furthermore, these effects are often amplified by questionnaire items that address environmental aspects and, in some cases, even by explaining the meaning of ecolabels beforehand. The key point is that these biases tend to reinforce each other rather than cancel each other out.

A less explored question is whether consumers use ecolabels to make inferences about product characteristics, such as quality and safety, beyond their environmental implications. Generally,

it has been observed that findings vary by context (Donato and D'Aniello 2022). Some studies showed that consumers perceived decreases in quality in certain circumstances (Van Doorn and Verhoef 2011; Delmas and Lessem 2017; Abraben et al. 2017; Chen et al. 2019), while others reported they perceived an increase (Wiedmann et al. 2014; Sörqvist et al. 2015; Vitale et al. 2020; Vega-Zamora et al. 2013, 2014).

Beyond their perceptions of the quality of products, consumers may make inferences about other important product attributes that might, in turn, influence their purchase decisions, although these attributes have received less attention in the literature. These dimensions include healthiness, naturalness, tradition (authenticity), elitist/gourmet appeal, sustainability, and the values of the producers, such as honesty, commitment to quality, effort expended, and social responsibility. These characteristics may have varying significance for the consumer depending on the purchasing and consumption context—whether for regular personal use, special private occasions, hosting, or as institutional gifts. The weight of each attribute in the consumer's final decision is likely to change with the context. For instance, the exclusivity of a wine or olive oil may be unimportant in terms of everyday use but may become important when selected as a gift for someone significant. But how do consumers assess the presence of these dimensions in a product? Logically, they infer them from cues presented in the product's packaging. Of these cues, what role do ecolabels play in shaping consumers' inferences?

In this study, the aim is to go beyond consumers' general evaluations of products and their perceptions of their environmental impact: the aim is to determine whether ecolabels serve as heuristic cues that shape the inferences consumers make about products' attributes and dimensions. This approach differs from the mainstream literature, which focuses on a rational-cognitive view of the consumer. Understanding how consumers make quick inferences when presented with complete labeling—without clearly realizing what is being studied (and without artificially enhanced ecolabels)—can be highly useful for analyzing the true role of ecolabels in consumer behavior. The first step is to analyze this issue from the perspective of heuristic research.

3 | Theoretical Framework

Unlike the rational consumer model, the literature on heuristic processing suggests that people often rely on quick, intuitive judgments rather than detailed analyses, especially when under time constraints or when they are uncertain. Essentially, these shortcuts (Mir-Artigues 2022; Todd and Gigerenzer 2012) avoid deep, complex information processing. Heuristics is the answering of a complex question with a simpler one (Kahneman 2003) or assessing one attribute by substituting it with another more readily accessible (Kahneman and Frederick 2002). For example, a tourist looking to buy a quality wine as a gift might choose a particular bottle simply because it is prominently displayed in a gourmet shop. From the shop's reputation, they infer that the wine must be of good quality—otherwise, it would not be featured so prominently. Heuristics are cognitive tools that facilitate quick, effortless decision-making, although they may lead to errors. They are strategies that minimize mental effort (Shah and Oppenheimer 2008) and selectively disregard some of the available information (Gigerenzer and Gaissmaier 2011).

The heuristic research program assumes that the heuristics and decision-making rules consumers use are influenced by both the individual and the context. Food shopping, particularly in a self-service environment, exemplifies heuristic decision-making. It involves consumers making quick judgments where much of the information available on the product packaging and surrounding environment is either selectively ignored or is unknown, and where they often lack in-depth knowledge of the various products, brands, labels, and other information (e.g., nutritional) that appears on packaging. Beyond their literal meaning—which can be challenging for consumers to interpret—these labels/information serve as cues/indicators of product attributes which allow consumers to infer the credence attributes of products.

Each label can act as a heuristic cue, an initiator or simplifier in a mental process through which consumers reach decisions/make assessments by focusing their thinking and by filtering out some information. These heuristic cues provide both a general meaning (e.g., a certification seal or a brand) and a specific meaning (e.g., a European Union ecolabel, the Nestlé brand). Thus, a distinction is made between the generic impact of affixing an ecolabel and the specific impact exerted by a particular label. The generic impact might be associated closely with the basic characteristics of certification processes in general (related to transparency, traceability, control), while the effect of a specific label may vary based on the individual consumer's knowledge, trust, and attitudes towards that label. For example, Chen et al. (2019) found that organic food certification in China is associated with doubts about quality and safety, largely due to the numerous scandals that have emerged involving these products. However, other authors such as Cho et al. (2024) argue that specific ecolabels provide more detailed information, which can reduce ambiguity and increase perceived benefit, trust, and consumers' purchase intention.

In the framework proposed in this study, the influence of ecolabels on intuition and inference processes is broken down into two effect types, generic and specific. From the generic perspective, the evocative power of ecolabels is generally the same for all consumers, while, from a specific perspective, it varies according to the particular ecolabel studied. This framework raises questions about the interchangeability of ecolabels, for example, whether similar inferential effects are exerted by ecolabels. It also addresses whether ecolabels hold unique meanings, which would be evident if they affected inferential processes differently from the generic (meaningless) ecolabel. The underlying logic is that specific cues are associated with a narrow focus and yield only partial, context-dependent conclusions (e.g., the effect of seal X on perceptions of quality, naturalness and sustainability of product Y among consumers Z in country K), which has essentially been the approach of past ecolabel-focused studies.

In the present study, an examination is undertaken of whether ecolabels, beyond their literal meanings and intended purpose of promoting environmental care and preservation, serve as heuristic cues for consumers that provide both general and

specific meanings that allow them to draw inferences about products' attributes. To explore this, four research questions are posed to sequentially investigate, in depth, the heuristic functions of ecolabels.

RQ1. *Is there a difference in the inferences consumers make when viewing a product with and without ecolabels? If so, it would be useful to analyze the impact of the quantity of ecolabels presented.*

This question relates to the literature that generally shows a positive effect of ecolabels on product evaluation (Abdu and Mutuku 2021). However, it aims to go further by exploring whether the mere presence of ecolabels influences specific inferences about different product attributes, such as quality, authenticity, sustainability, producer honesty, and so on. Additionally, by considering the effect of the number of ecolabels, it connects to an issue with mixed findings in the literature: the effectiveness of accumulating ecolabels. Some studies suggest diminishing cumulative effects (Dufeu et al. 2014; Zhu et al. 2023), while others do not find a positive linear effect (Tebbe and von Blanckenburg 2018). This leads to RQ2:

RQ2. *Is there a linear relationship between the quantity of ecolabels presented and consumers' inferences?*

This RQ aims to clarify whether there is a direct relationship between the number of ecolabels and consumer perceptions, considering the growing proliferation of ecolabels (Nes et al. 2024). If the answer is affirmative and positive, it would suggest that producers should use the maximum possible quantity of ecolabels. If the answer is negative, we move on to RQ3.

RQ3. *Is there an optimal quantity of ecolabels? If this is also negative, and taking into account RQ1, it would be cost effective to use only one ecolabel.*

Given the lack of consensus in the literature regarding the benefits of using multiple ecolabels, this question explores the possibility of a saturation point where adding more labels does not provide additional value or may even lead to confusion (Carmona 2011; Zaman et al. 2010). It relates to studies suggesting that increasing the number of ecolabels does not always lead to stronger effects (Moon et al. 2016; Tebbe and von Blanckenburg 2018), or that the additive effect depends on the market segment (Grunert et al. 2014). This question seeks to offer practical implications for producers in terms of the costs and benefits of certification.

RQ4. *Are there differences in consumers' inferences when ecolabels function as general versus specific cues? If not, it would imply that ecolabels could be used interchangeably, given that they convey the same messages.*

This question introduces a novel perspective by distinguishing between the effect of ecolabels as generic cues (evoking certification in general) and specific cues (real labels with known meanings). Previous literature has focused more on the study of specific ecolabels and their impact (Cho et al. 2024), but this research question seeks to determine whether consumers process ecolabels in a superficial way, assigning them a general meaning rather than recognizing the specific value of each label.

In general, this work distinguishes itself from the predominant literature by adopting an approach to ecolabels as heuristic cues. Rather than focusing on willingness to pay or a detailed understanding of ecolabels, it investigates whether consumers use them as mental shortcuts to quickly infer various product characteristics in a real purchase context (with limited time to process information). Furthermore, the methodology employed seeks to minimize the overestimation of the effect of ecolabels suggested in previous studies.

Essentially, this study aims to determine whether, beyond their literal meaning related to environmental protection, ecolabels function as heuristic cues that provide general and specific meanings to consumers, allowing them to infer important product characteristics. The research focuses on the context of extra virgin olive oil and consumers in Spain.

4 | Methodology

A balanced between-subjects experiment was designed, the subjects being recruited from an online panel of a market research company in Spain, affiliated with the European Society for Opinion and Marketing Research (ESOMAR), which adheres to validated protocols and quality standards. The participants were divided into 10 experimental groups, each of 60 individuals, and one control group of 120. The composition of the groups was similar in terms of age and gender (25% men aged 20 to 45 years, 25% men aged 46 to 70 years, 25% women aged 20 to 45 years, 25% women aged 46 to 70 years). The treatment-group assignment was randomized.

The experiment was based on subjects looking at a real virgin olive oil label and looking at a bottle on a computer screen. Extra virgin olive oil is a product that is increasingly consumed around the world, and its gastronomic, health, and cultural characteristics allow producers to provide on their packaging a wide variety of information. Furthermore, it is a product on which sustainability-related labels usually appear. The stimuli presentation was generally the same in all cases, the only variation being that in five of the experimental groups, one to five different, real seals were shown on the label (see the example at Figure 1), and the other five groups were shown fake ecolabels that had been designed specifically for the experiment. The ecolabels, real and fake, are displayed in Figure 2. The purposes of presenting this second group of seals were, first, to allow an analysis to be undertaken of the generic role of ecolabels, that is, in filtering out specific meanings and, second, to provide a frame of reference to analyze, by comparison, the specific cues associated with the real seals. The control group was presented labels without seals. The characteristics of the sample and the experimental design are summarized in Table 1.

The experiment was designed to prevent the participants from making assumptions about the purpose of the procedure, as this might bias the results. The label modifications were not presented in isolation; rather, they were presented on packaging in realistic contexts, that is, where seals appear alongside

FIGURE 1 | Example presentation (experimental group with three real seals). Expanded label and packaging.

FIGURE 2 | Labels used in the experiment. The five on the left are real, and the five on the right are fake (created for this study).

After viewing the labels and bottles, the participants responded to the comparison scale shown at Table 2, which served as the basis for group comparisons. To ensure the participants' attention and engagement, as well as response accuracy, two control questions were posed at the end of the test: "What type of product was being analyzed?" and "What was the brand name?" Responses with errors in the answers were discarded from the analysis. Once the erroneous cases in control cases have been discarded, the final sample size was 720.

TABLE 1 | Sample and experimental design characteristics.

Sample size	$N = 720$	Experimental design (between groups)[a]
Gender	(%)	Group 1: botte and label with 1 true seal ($n_1 = 60$)
Male 50%	50.0	
Female 50%	50.0	
Age (from 20 to 75)	Mean 46.11 Std 12.63	Group 2: botte and label with 2 true seals ($n_2 = 60$)
Level of education completed	(%)	Group 3: botte and label with 3 true seals ($n_3 = 60$)
No formal education	0.1	Group 4: botte and label with 4 true seals ($n_4 = 60$)
Primary education	2.8	Group 5: botte and label with 5 true seals ($n_5 = 60$)
Secondary education, vocational training, or equivalent	53.3	Group 6: botte and label with 1 false seal ($n_6 = 60$)
University education	43.6	Group 7: botte and label with 2 false seals ($n_7 = 60$)
Household composition	(%)	Group 8: botte and label with 3 false seals ($n_8 = 60$)
I live alone	11.0	Group 9: botte and label with 4 false seals ($n_9 = 60$)
I live with my parents	10.4	Group 10: botte and label with 5 false seals ($n_{10} = 60$)
I live with a partner	66.2	Group 11: bottle and label without seals ($n_{11} = 120$)
Other	12.3	
Living with children < 15 y.o.	(%)	
Yes	43.1	
No	57.9	

[a]All groups are similar in terms of age and gender (25% men aged 20 to 45 years, 25% men aged 46 to 70 years, 25% women aged 20 to 45 years, 25% women aged 46 to 70 years).

5 | Results

5.1 | Effect of Including Environmental Seals on the Label (RQ1)

To determine whether the presence of environmental labels or certificates influences product ratings and inferences, a MANCOVA (Multivariate Analysis of Covariance) was conducted. This method is appropriate for analyzing whether there are mean differences between groups of dependent variables based on the introduction or absence of ecolabels, considering the influence of a covariate. (e.g., Hair 2023). the dependent variables, listed in Table 3 (excluding "liking for presentation"), were analyzed with two explanatory variables: a dichotomous variable indicating the presence or absence of seals, and the covariate "general liking for presentation," which could reasonably impact on the other dependent variables. In other studies (Torres-Peña et al. 2025), the linking for presentation has been shown to be a powerful heuristic cue that affects inferences about different product attributes. Prior to undertaking the MANCOVA, the hypothesis of parallelism was tested by including the interaction between the covariate and the factor in the model.

The results (see Table 3) indicate that all the model's variables exerted significant effects. Presenting a seal resulted in significant differences in the mean vector of the dependent variables (Wilks' Lambda = 0.970, F (7, 727) = 3.24, $p = 0.002$, $\eta_p^2 = 0.030$). The interaction with the covariate "liking for presentation" was also significant (Wilks' Lambda = 0.974, F (7, 727) = 2.74, $p = 0.008$, $\eta_p^2 = 0.026$). However, the covariate "liking for presentation" had the largest impact (Wilks' Lambda = 0.602, F (7, 727) = 68.61, $p < 0.001$, $\eta_p^2 = 0.398$).

The ANCOVAs (analyses of covariance) of the dependent variables (see Table 3) indicated that differences primarily arose in two variables related to the human component, that is, effort (expended) and commitment to quality, and trust and honesty. For these two variables, the product received higher ratings as the participants' liking for its presentation increased; however, this relationship was influenced by the presence/absence of seals. In both cases, the ratings improved when seals were displayed on

TABLE 2 | Questions posed in the questionnaire (after viewing the labels/packaging).

1. What level of quality do you suggest this oil could have? (0 bad—10 excellent)
2. In general, I liked the presentation (packaging and label) of the product (0 not at all—10 very much).
3. This product evokes in me aspects of authenticity and tradition (0 not at all—10 very much).
4. I consider it to be an elitist, gourmet product (0 not at all—10 very much).
5. I consider it to be a natural and healthy product (0 not at all—10 very much).
6. The product evokes or transmits to me the effort made by, and commitment to quality of, the manufacturers (0 not at all—10 very much).
7. The product makes me believe in the trustworthiness and honesty of the manufacturers (0 not at all—10 very much).
8. The product seems to me to be sustainable (0 not at all—10 very much)

TABLE 3 | ANCOVA effects of having, or not having, seals, and liking for the label presentation, on each variable.

Indep. V	Dep. V.	S.C.	DF	M.C.	F	Sig.	η_p^2
Factor: with/without seal	Effort and commitment	16.510	1	16.510	8.207	0.004	0.011
	Honesty and trust	21.074	1	21.074	9.213	0.002	0.012
	Sustainability	8.319	1	8.319	2.996	0.084	0.004
Covariate: liking for presentation	Quality	428.386	1	428.386	315.192	0.000	0.301
	Authenticity and tradition	812.234	1	812.234	248.210	0.000	0.253
	Elitist, gourmet	567.152	1	567.152	209.206	0.000	0.222
	Natural, healthy	405.389	1	405.389	206.521	0.000	0.220
	Effort and commitment	464.016	1	464.016	230.649	0.000	0.239
	Honesty and trust	474.979	1	474.979	207.637	0.000	0.221
	Sustainability	466.974	1	466.974	168.207	0.000	0.187
Interaction factor*covariate	Effort and commitment	16.538	1	16.538	8.221	0.004	0.011
	Honesty and trust	17.995	1	17.995	7.866	0.005	0.011

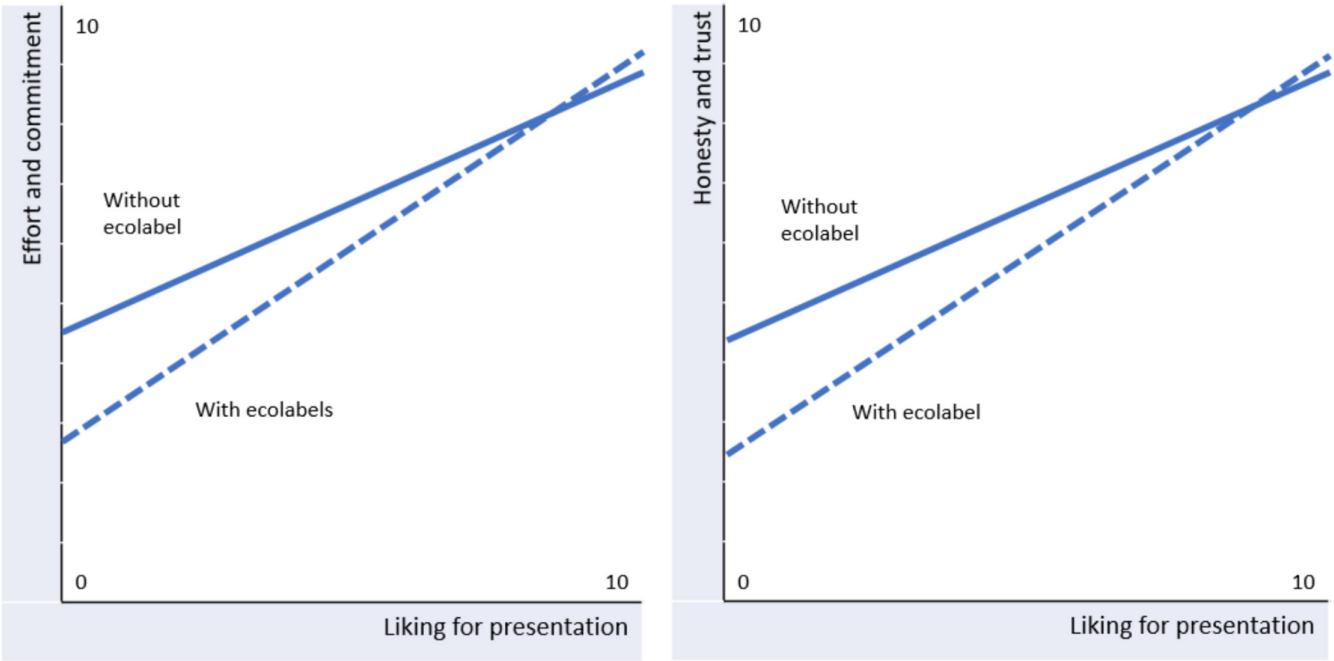

FIGURE 3 | Regression lines.

the labels, particularly when the covariate "liking for presentation" was above 8 (see Figure 3). For the remaining variables, the ratings were primarily dependent on the covariate, that is, the more the presentation was liked, the higher were the ratings for each variable in the group (see the regression coefficients in Table 4). Whether or not ecolabels were featured did not impact on these ratings. In summary, the presence of environmental seals enhanced consumers' perceptions of the efforts expended by the producers, and the latter's commitment to the product, generally increasing in proportion to how much they liked the product presentation.

5.2 | Analysis of the Linear Effect of the Quantity of Seals on Product Inferences (RQ2)

A MANCOVA was conducted for all the dependent variables. The independent variables included the type of seal (real or fake), the covariate "liking for presentation," and the covariate "quantity of seals" (ranging from 1 to 5), nested within seal type (real or fake), as the seals differed between the two groups. In addition, the interaction term (seal type × liking for presentation) was included to test the homogeneity of the slopes.

TABLE 4 | Estimates of the regression coefficients for each dependent variable (significant effects only).

Dep. V.	Parameter	Beta	Dev. error	t	Sig.	IC 95%		η_p^2
						L I	L U	
Quality	Intersection	4.165	0.203	20.522	0.000	3.766	4.563	0.365
	Liking for presentation	0.519	0.024	21.412	0.000	0.471	0.566	0.385
Authenticity and tradition	Intersection	1.174	0.315	3.729	0.000	0.556	1.793	0.019
	Liking for presentation	0.761	0.038	20.238	0.000	0.687	0.834	0.358
Elitist, gourmet	Intersection	3.382	0.287	11.798	0.000	2.819	3.944	0.160
	Liking for presentation	0.579	0.034	16.937	0.000	0.512	0.647	0.281
Natural, healthy	Intersection	4.109	0.244	16.849	0.000	3.630	4.588	0.279
	Liking for presentation	0.538	0.029	18.489	0.000	0.481	0.595	0.318
Effort and commitment	Intersection	2.742	0.247	11.104	0.000	2.257	3.226	0.144
	No seal	1.739[a]	0.607	2.865	0.004	0.547	2.932	0.011
	Liking for presentation	0.659	0.029	22.360	0.000	0.601	0.717	0.405
	No seal * Liking for presentation	−0.209	0.073	−2.867	0.004	−0.353	−0.066	0.011
Honesty and trust	Intersection	2.409	0.263	9.152	0.000	1.893	2.926	0.103
	No seal	1.965[a]	0.647	3.035	0.002	0.694	3.236	0.012
	Liking for presentation	0.670	0.031	21.320	0.000	0.608	0.732	0.383
	No seal * Liking for presentation	−0.218[a]	0.078	−2.805	0.005	−0.371	−0.065	0.011
Sustainable	Intersection	2.739	0.290	9.443	0.000	2.169	3.308	0.108
	Liking for presentation	0.621	0.035	17.937	0.000	0.553	0.689	0.305

Note: Non-significant parameters have been excluded.
[a]Difference against the overall parameter (top row).

The results showed that neither seal type (Wilks' Lambda = 0.986, F(7, 603) = 1.25, $p = 0.272$, $\eta_p^2 = 0.014$), nor the quantity of seals (Wilks' Lambda = 0.980, F(14, 1208) = 0.88, $p = 0.579$, $\eta_p^2 = 0.010$), nor the interaction between seal type and liking for the presentation (Wilks' Lambda = 0.984, F(7, 603) = 1.36, $p = 0.219$, $\eta p^2 = 0.016$) impacted the vector of the dependent variables. Only liking for the label presentation had a significant effect (Wilks' Lambda = 0.435, F(7, 603) = 111.87, $p < 0.001$, $\eta_p^2 = 0.565$) on the ratings. In other words, there was no linear relationship between the quantity of seals presented and consumers' product inferences, regardless of whether the seals were real or fake. This lack of effect is also evident in the regressions conducted for the dependent variables (see Table 5), where the regression coefficients for the quantity of seals were consistently non-significant.

5.3 | Non-Linear Effects: Exploring the Optimal Quantity of Seals (RQ3)

Ecolabel-focused research suggests there may be an optimal quantity (which varies between studies) above which presenting additional ecolabels does not enhance, and may even reduce, product ratings. To investigate this further, two MANCOVAs were conducted, using a vector of dependent variables and analyzing two groups of seals, real and fake. This between-groups distinction is important because, in one scenario, the "pure" effect of adding seals is examined, whereas, in the other, the effects on consumers' inferences about the product are influenced by their interpretations of each seal's specific meaning. In both cases, the quantity of seals (ranging from 1 to 5) was introduced as a factor to evaluate whether the differences between various quantities of seals were significant and, if so, to quantify these differences. In addition, liking for presentation was included as a covariate due to its influence on product ratings.

The results of this analysis indicates that there were no significant differences in the consumers´ inferences based on quantity of seals, for both fake seals (Wilks' Lambda = 0.948, F(28, 1072) = 0.58, $p = 0.963$) and real seals (Wilks' Lambda = 0.901, F(28, 1061) = 1.11, $p = 0.321$). In both scenarios, the covariate "liking for presentation" was significant (Wilks' Lambda = 0.387, F(7, 297) = 67.30, $p < 0.001$ for fake seals; Wilks' Lambda = 0.473, F(7, 294) = 46.89, $p < 0.001$ for real seals). Consequently, given the costs of certification, one sustainability-based seal appears to be the optimal quantity.

TABLE 5 | Regression models of the seven dependent variables. Coefficients of quantity of seals (1–5) and liking for presentation.

Model (dependent variable)		Coef. no est.		Coef est.		
		Beta	Dev. Err.	Beta	t	Sig.
Quality	Constant	4.174	0.225		18.514	0.000
	Liking for presentation	0.519	0.024	0.652	21.257	0.000
	Quantity of seals	−0.003	0.034	−0.003	−0.102	0.919
Authenticity and tradition	Constant	1.329	0.352		3.780	0.000
	Liking for presentation	0.762	0.038	0.629	20.025	0.000
	Quantity of seals	−0.054	0.052	−0.033	−1.039	0.299
Elitist, gourmet	Constant	3.150	0.312		10.093	0.000
	Liking for presentation	0.578	0.034	0.567	17.103	0.000
	Quantity of seals	0.082	0.047	0.058	1.759	0.079
Natural, healthy	Constant	4.183	0.270		15.504	0.000
	Liking for presentation	0.539	0.029	0.598	18.450	0.000
	Quantity of seals	−0.026	0.040	−0.021	−0.650	0.516
Effort and commitment	Constant	2.803	0.271		10.349	0.000
	Liking for presentation	0.659	0.029	0.673	22.497	0.000
	Quantity of seals	−0.022	0.040	−0.016	−0.535	0.593
Honesty and trust	Constant	2.591	0.288		9.002	0.000
	Liking for presentation	0.671	0.031	0.657	21.549	0.000
	Quantity of seals	−0.064	0.043	−0.046	−1.495	0.135
Sustainable	Constant	2.788	0.323		8.622	0.000
	Liking for presentation	0.621	0.035	0.583	17.754	0.000
	Quantity of seals	−0.017	0.048	−0.012	−0.361	0.718

5.4 | Differential Effects: Generic Versus Specific Cues (RQ4)

A MANCOVA was conducted using a vector of dependent variables, focusing solely on cases with ecolabels, comparing two groups, real and fake seals. Due to its explanatory relevance, liking for presentation and the interaction between the covariate and the factor were included as covariates. Overall, the analysis indicated that seal type, whether real or fake, did not significantly impact on consumers' ratings and inferences (Wilks' Lambda = 0.979, F (7, 605) = 1.88, $p = 0.071$, $\eta_p^2 = 0.021$), nor did its interaction with the covariate (Wilks' Lambda = 0.984, F(7, 605) = 1.37, $p = 0.215$, $\eta_p^2 = 0.016$). Notably, only the covariate "liking for presentation" had a significant effect (Wilks' Lambda = 0.436, F (7, 605) = 111.97, $p < 0.001$, $\eta p^2 = 0.564$).

5.5 | Synthesis of Results

The heuristic role of ecolabels was examined through a sequential analytical process that provided the answers to the four research questions. Table 6 summarizes the main results obtained.

6 | Discussion

Are ecolabels effective? What is their role in consumer behavior? In this work, a heuristic information processing approach was taken to provide answers. The starting hypothesis is that ecolabels can act as heuristic cues that consumers might use to infer characteristics of objects, and that these inferences influence their evaluations of the objects. Based on the results of an experiment designed to have no influence on subjects' evaluations, the main conclusions of this work are that ecolabels have a very small role in consumers' intuition and inference processes. The following results and reflections are highlighted:

1. Product Presentation as a Dominant Heuristic Cue. Product presentation (liking for) serves as a strong heuristic that largely inhibits/overshadows the impact of ecolabels on consumers' inferences about products' features. This outcome can be explained by the following process: after forming a general impression based on a product's label, consumers activate a "stopping rule" that reduces their need to process further in-depth information to reach a conclusion. This aligns with the halo effect (Thorndike 1920), where an overall impression influences

TABLE 6 | Research questions and results.

Research questions	Results
RQ1: Is there a difference between consumers' inferences when they view product packaging that features ecolabels vs. not featuring ecolabels?	Products featuring ecolabels prompt consumers to infer greater "effort and commitment to quality" and "trust and honesty" (human component).
RQ2: Is there a linear relationship between the quantity of ecolabels and positive inferences?	There is no linear relationship. Increasing the quantity of ecolabels does not make inferences more positive
RQ3: Is there an optimal quantity of ecolabels?	There is no optimal quantity. Reflecting the response to RQ1, the optimal quantity would be one ecolabel.
RQ4: Are there differences in the inferences made based on ecolabels when they act as generic or specific cues?	There are no differences in the inferences made between real (generic + specific meanings) and fake (only generic meaning) ecolabels. Reflecting the response to RQ1, no specific meanings are perceived (only general are perceived)

consumers' perceptions of individual attributes. The participants formed a general opinion of the product based on initial impressions, which then shaped their assessments of specific product characteristics, which consistently aligned with their general opinions. This is indicated by the fact that all regression beta coefficients are positive, showing a directional correlation with overall liking. Furthermore, the literature often cites liking or attraction to an object as a heuristic (affective heuristic)—see Frederick (2002) for a review. Thus, affective reactions to stimuli are often automatic; they are the first to occur and drive all subsequent information processing (Zajonc 1980; Slovic et al. 2007). This entire process can be represented as follows:

Stimulus → Perception and Evaluation of Presentation (label + packaging) → Stopping Rule (formation of a general opinion or assessment, no further analysis of information required) → Inference of Other Product Characteristics.

These results are consistent with a recent study that shows product presentation is an important heuristic cue that inhibits the effect of other labeling signals (Torres-Peña et al. 2025).

A key question is whether this process would take place with labels that are less attractive to consumers. If the label is not compelling enough to achieve an overall positive consumer evaluation, would other heuristic cues become more influential in guiding his or her inference processes? Possibly. If no presentational aspect allowed the consumer to infer that the product is good, it is logical to suppose that (s)he will look for other heuristic cues to evaluate, compare, and choose, which increases their importance. This supposition aligns with literature suggesting that ecolabel effectiveness diminishes for brands with strong reputations (Larceneux et al. 2012; Bauer et al. 2013; Burstow et al. 2025). In these cases, a strong primary stimulus overrides other cues, changing the consumer's line of thought and perceptions. These findings underline the need to undertake further studies that incorporate varying levels of label attractiveness to better understand how different stimuli interact. In short, the processes of intuition and inference are sensitive to the framing effect (Tversky and Kahneman 1981), which is based on the proposal that there is a need to consider the context in which ecolabels are displayed. Obviously, this has important methodological implications—see below.

2. Ecolabels Are Only Superficially Processed in Inference Making. Ecolabels appear to play a limited role in influencing consumers' inferences, as evidenced by the absence of increased ratings with additional seals, and that there is no optimal quantity of labels. This result is consistent with studies that have shown that merely adding ecolabels to packaging does not amplify their effects (Judijanto et al. 2025; Moon et al. 2016; Roesch et al. 2025; Tebbe and von Blanckenburg 2018). In addition, our findings show there are no significant differences in the effects of fake and real ecolabels. This implies that ecolabels primarily allow consumers to make broad inferences about producers (e.g., honesty, commitment to quality, trustworthiness), which can be achieved with a single seal regardless of its specific nature (real or fake). In other words, ecolabels act only as generic cues in consumers' inferential processes, at

least in the context of the present study (extra virgin olive oil and a real label featuring a lot of information).

Interestingly, the study did not find that the presence of ecolabels enhanced consumers' inferences of sustainability and quality, although the literature returns mixed findings about this issue. Some studies suggest that although ecolabels can improve perceptions of sustainability and influence inferences about quality, their impact is complex and depends on the context. Factors such as product category, consumer knowledge, and label design influence how ecolabels affect consumers' perceptions and purchase decisions (Ferreira and Fernandes 2021; Houf et al. 2024; Thøgersen et al. 2010).

Several recent studies support this limitation of ecolabeling. Dervishi and Dohle (2025) observed that Nutri-Score and Eco-Score labels did not influence taste, desire, or willingness to pay. Similarly, Luick et al. (2025) found no evidence of significant changes in purchasing behavior due to ecolabels, while Berden and Hung (2025) indicated that ecolabels influenced sustainability perception but had no effect on attraction or willingness to pay. Furthermore, Popowicz et al. (2025) highlight that although ecolabels have the potential to promote sustainable consumption, they are often perceived as complex, ambiguous, and homogeneous, which limits their effectiveness. This raises questions about the specific meanings consumers assign to ecolabels and suggests that ecolabels alone may not drive stronger sustainability-related product inferences. Considering the huge number of ecolabels in the market, it seems that something more is needed to build consumer trust.

Although the results of this study provide a deeper understanding of the limited role of ecolabels in consumers' inference processes, it is important to consider the implications of these findings from both a theoretical and practical perspective, as well as the study's limitations and possible directions for future research.

6.1 | Methodological Implications

While the literature on the efficacy of ecolabels varies with context, the findings of this study suggest that they have a smaller impact than has been suggested in most published studies. Assuming that the study sample is similar to those used in other works, it is possible that the divergence of results is due to the different purposes of the studies and the methodologies used. For the reasons previously mentioned, it is proposed in this study that the effect of ecolabels is likely overestimated, especially in studies where the complete product presentation is not shown or where different options are presented sequentially for consumers to choose from (and logically infer the researchers' purpose). For more realistic outcomes, future research should aim to minimize biases that might stem from participants' awareness of the study's intent, in order to avoid courtesy and social desirability biases. Ensuring that the visibility of ecolabels aligns with typical market conditions could help achieve this. This could involve using real, comprehensive labels, but without exaggerating the prominence of ecolabels, and by employing between-groups designs, where each participant views only one product version. These steps would make it harder for participants to guess the study's focus, thereby reducing the potential influence of expectations. Otherwise, the participants may feel "pressured" to evaluate ecolabels they might overlook in normal purchase settings.

6.2 | Management Implications

For producers, the primary takeaway of this study is that featuring more than one ecolabel is unnecessary, and it does not matter significantly which label is chosen. The study's findings revealed only minimal differences in consumer responses, even between real and fake ecolabels. Thus, ecolabels function as general indicators that convey a sense of honesty, commitment, and responsibility on the part of the producer rather than differentiating product attributes. However, this is not incompatible with the fact that there are particularly concerned groups for whom an ecolabel is a *sine qua non* requirement for the purchase of a product. In this respect, the question arises as to whether this effect is exclusive to ecolabels or whether it could be generalized to other certifications. That is, is certification generally interpreted by consumers as showing the producer is honest and socially committed?

6.3 | Social Implications

From an environmental behavior promotion perspective, the results suggest the need to look for alternative means and strategies to increase the consumption of sustainable products. Either because of the large quantity of ecolabels in existence, or the lack of harmonization and trust they transmit, it seems that consumers do not pay much attention to them. Two strategies are suggested: (1) to reduce the quantity of ecolabels used by making the requirements more stringent at governmental and supranational levels for their inclusion in labeling and, in parallel; (2) to identify these ecolabels as "official". This simplifying and integrating solution is not without problems—see Torma and Thøgersen (2021) for a review on sustainable meta-certificates. However, it is proposed that consumers would have more ease of cognition, learning, and trust in ecolabels if there were fewer of them, if the producers' communications were more focused on fewer of them, and if they were subject to more rigorous international and officially established controls. What is clear is that the current alternative of hundreds of ecolabels on the market does not seem to work for the purpose for which they were designed.

6.4 | Limitations

Finally, and as a main limitation, it is important to recognize the specific nature of the study, in the sense that its conclusions and reflections have been produced in a particular frame of reference: extra virgin olive oil, Spain, a well-liked presentation and using a consumer group with no particular affinity to environmental issues (randomly selected without asking anything about the environment beforehand, to avoid response bias). It would be interesting to replicate the study using, at least, other products—for example, some studies have shown that using ecolabels has negative effects on consumers' perceptions of wine quality (which has been called ecopenalty) (Delmas and Lessem 2017;

Abraben et al. 2017)—and, given the importance of product presentation, with packaging and labels with varied consumer appeal. Additionally, there are two other possible limitations that also constitute future research directions. First, we have used different items to measure the inference process, but there may be more that would be interesting to determine. Second, we have analyzed the inference processes, but what about the purchase processes? Although evaluations and choices are theoretically related, it would be interesting to replicate the results in choice processes. Another future research direction, previously mentioned based on the results obtained, is testing ecolabels with different types of labeling (more and less attractive) to analyze the influence of this on the perception of ecolabels.

7 | Conclusion

The influence of ecolabels on consumer behavior has received considerable attention in the literature, primarily from a linear-cognitive approach in which it is assumed that people understand their meaning (or are previously explained in the tests) and are able to assess the utility they provide. In this work, we have adopted a different approach, based on heuristic processing. With the aim of analyzing whether consumers use ecolabels as cues to infer different product characteristics (beyond their environmental role), we have explored the effect of the number of ecolabels and, for the first time, whether they primarily act as generic or specific cues in different product dimensions (some of which have not been considered in the literature). To do this, we designed an experiment in such a way that it would be difficult for participants to infer the purpose of the test, using real labels with complete information, in order to minimize various response biases.

Based on the results obtained, the main conclusions show that, aside from their environmental meaning, ecolabels act as heuristic cues that allow inferences about other product characteristics. However, at a general level, the role of ecolabels in consumer inferences is quite limited (at least in the context of the study), and their processing is very superficial. Furthermore, the number and specific certificate included do not matter much. They essentially act as a generic certification heuristic, improving impressions of the human component associated with companies. These findings suggest that while ecolabels have the potential to influence consumer perceptions, their impact on generating deeper inferences and shaping consumer behavior is more limited than commonly assumed. Therefore, further research is needed to explore how other factors, such as product context and consumer characteristics, may enhance the effectiveness of ecolabels in promoting sustainable consumption choices.

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