

Introduction

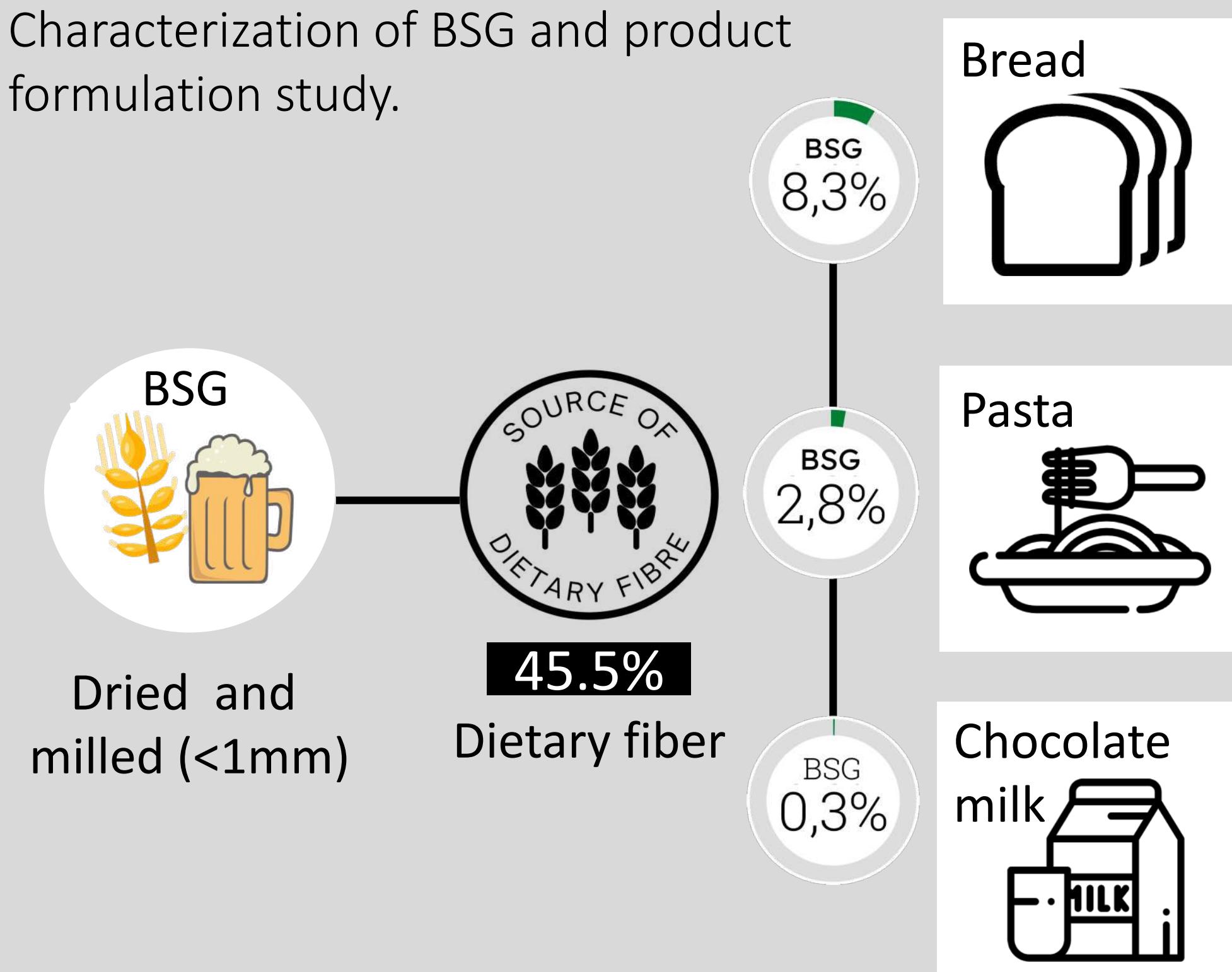
Food waste generated by the food industry is a prominent contributor to the environmental impact. The increasing consumers' concern in the impact of food production on the environment seems to demand environmentally friendly food products. In this context, one possibility is the use of by-product, like Brewer's Spent Grain (BSG), as a food-grade ingredient, provided that their environmental benefits are clearly conveyed to consumers. This would be advantageous to the environment and to human health, as BSG has a high content of dietary fibre.

The aim of this study was to analyze consumers' attitudes towards sustainable and functional food products belonging to different food categories. Firstly, the effect of various label messages on consumers' acceptability and purchase intention was assessed through eye-tracking technology. Secondly, the impact of information on consumers' sensory acceptability was examined and compared with evaluations carried out under uninformed conditions.

Materials and Methods

1 PRODUCT FORMULATION

Characterization of BSG and product formulation study.



2 EYE-TRACKING STUDY

Three categorical two-level factors of the product labels were studied for each product:

- Sustainability logo: Present/Absent
 - BSG description: Present/Absent
 - BSG appellation: Malted Barley/ BSG flour
- 8 labels

Definition of Areas of interest (AOI).

Labels were presented to 30 consumers in random order for 5 seconds (Task 1), and again for an unlimited period followed by a question regarding purchase intention or acceptability (Task 2).

Time to first view, fixations and total time viewed were measured.

3 SENSORY EVALUATIONS

Over 100 consumers evaluated regular and fibre-enriched samples of each product separately.

Evaluation consisted of:

- "Check all that apply" (CATA) questionnaire
- Overall acceptability rating
- Purchase intention ranking.

Blind condition

Without information about products.



Informed condition

Selected labels from the eye-tracking study were shown.



Results and Discussion

EYE-TRACKING STUDY

FACTORS	Purchase intention (PI)					
	Bread	Pasta	Chocolate milk	Bread	Pasta	Chocolate milk
Relative importance	Part-worth utilities	Relative importance	Part-worth utilities	Relative importance	Part-worth utilities	
Sustainability Logo	31%	0.21	35%	0.17	39%	0.25
BSG description	69%	0.47	65%	0.43	61%	0.38
R ²	0.978		0.964		0.842	

Table 1. Part-worth utilities and relative importance of the studied factors for purchase intention regression (PLSR)

For the three products, purchase intention increased when the label included the sustainability logo and BSG description, being the last one the most significant.

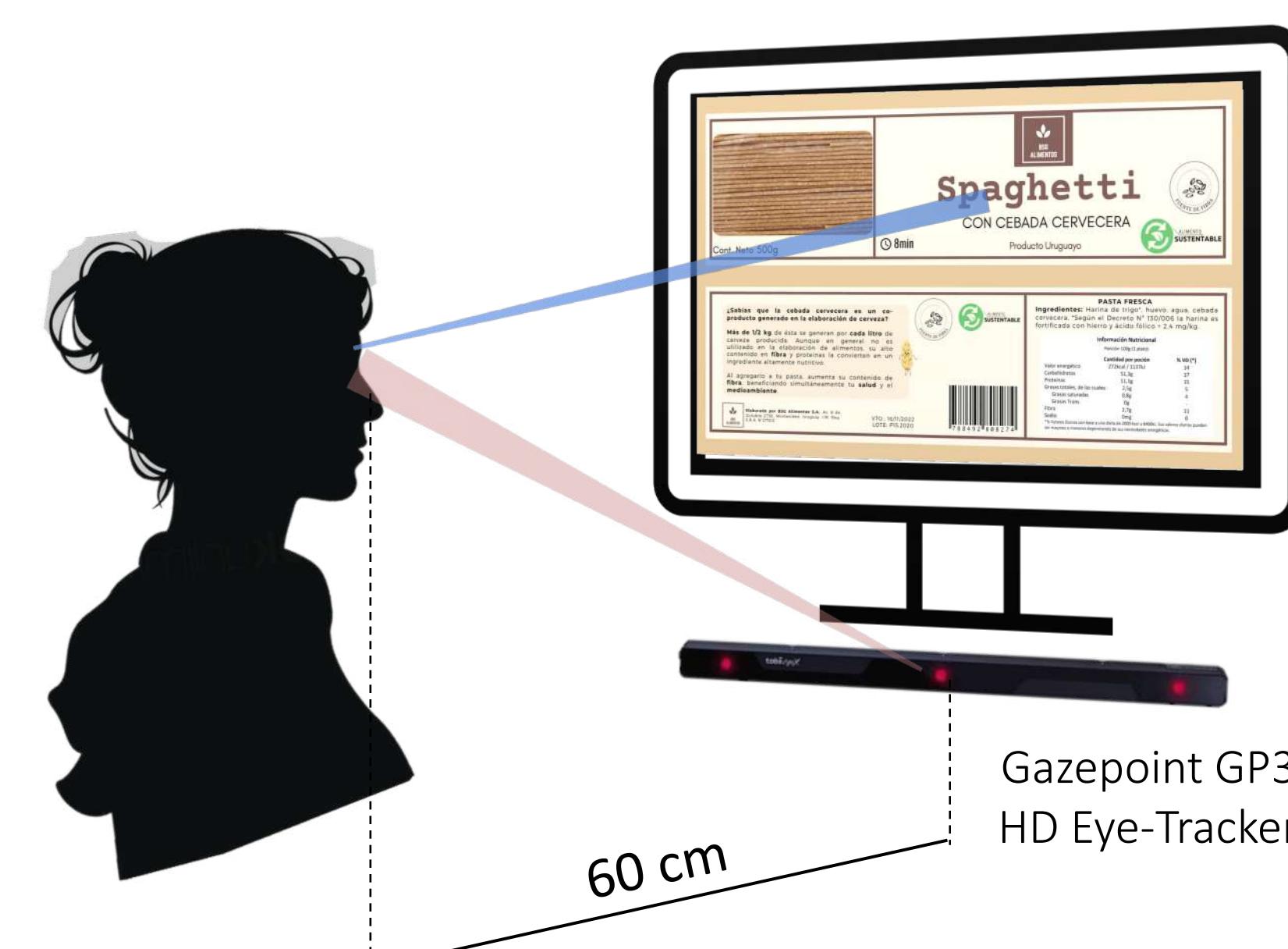


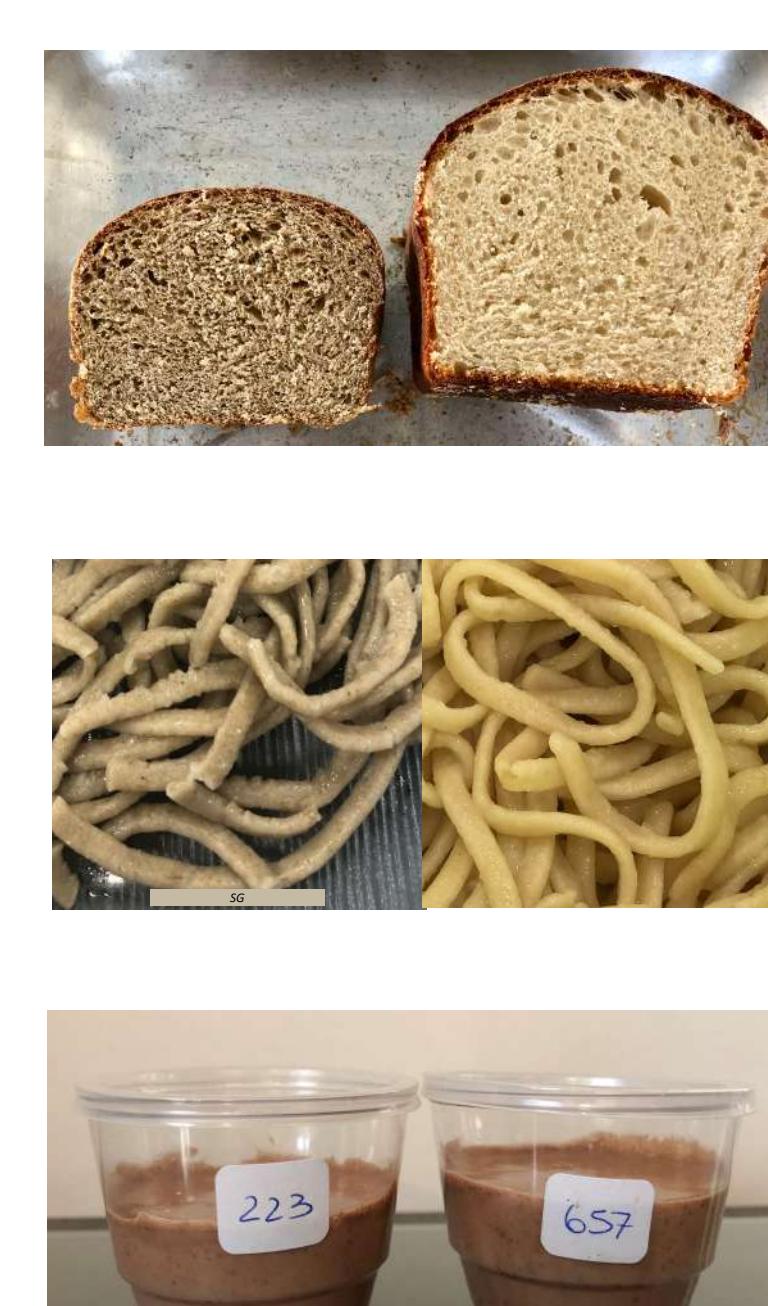
Figure 1. Eye-tracking setup used during the study.

The best consumers' response occurred when the label displayed: sustainability logo, fibre source claim and BSG description.



Figure 2. Frequency of check-all-that-apply (CATA) terms for the Fibre-enriched Pasta and the Regular Pasta under blind condition. (*) indicates significant difference at $p < 0.05$ according to Student's T test.

Undesirable BSG-introduced sensory changes were less perceivable when information was provided.



Product	Acceptability	PI
Bread		
Regular	7.10 ± 1.48^a	3.93 ± 1.00^a
Fibre-enriched	6.44 ± 2.06^b	3.75 ± 1.26^a
Pasta		
Regular	6.87 ± 1.45^a	4.14 ± 0.93^a
Fibre-enriched	6.91 ± 1.91^a	4.00 ± 1.20^a
Chocolate milk		
Regular	6.47 ± 1.86^a	3.55 ± 1.26^a
Fibre-enriched	5.68 ± 2.13^b	3.03 ± 1.34^b

Table 2. Acceptability and PI (Purchase intention) ($\text{mean} \pm \text{SD}$) for bread, pasta and chocolate milk; regular and fibre-enriched product. For each category, scores not sharing letters are significantly different ($p < 0.05$) according to Student's T-test.

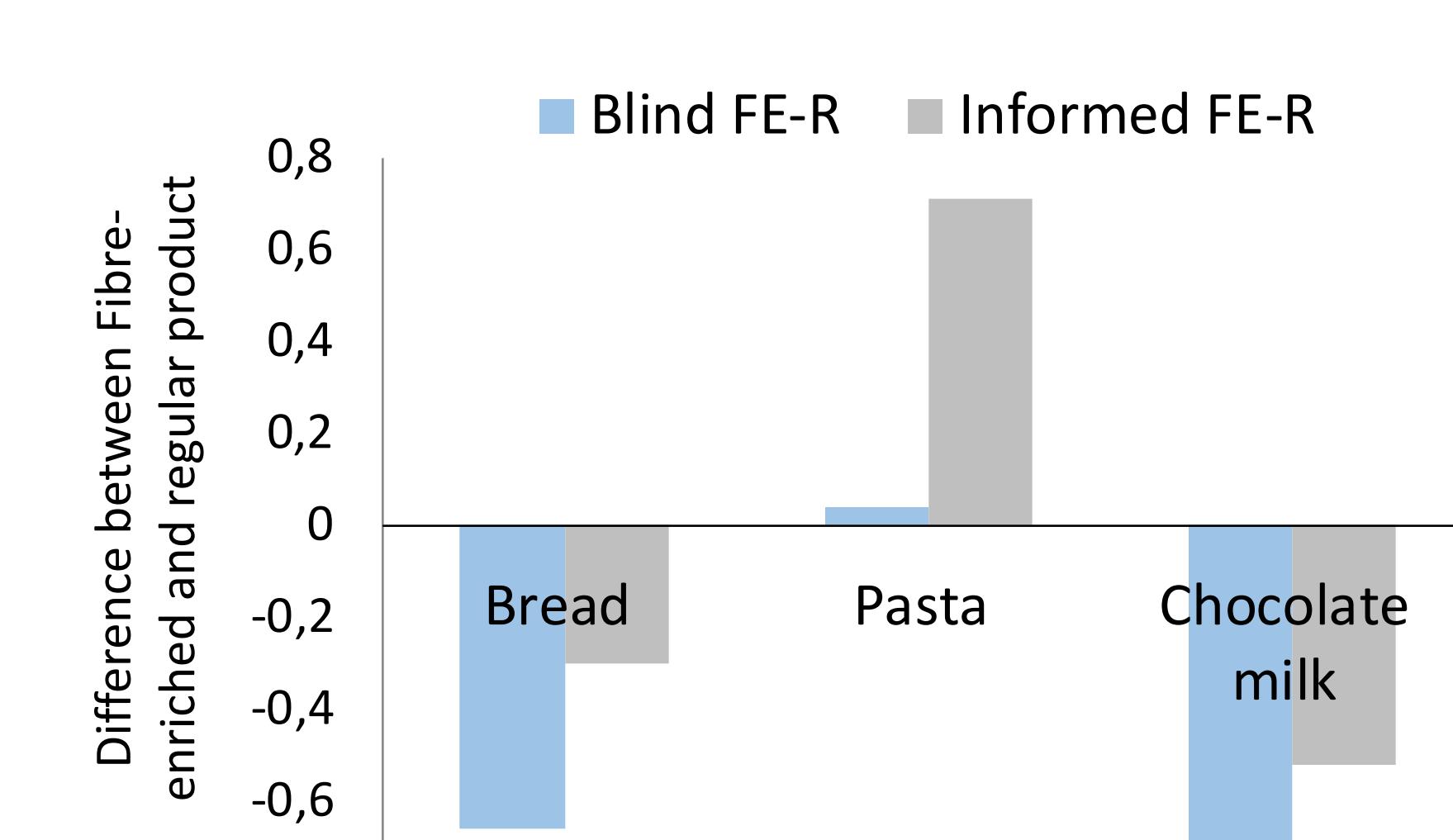


Figure 3. Difference between acceptability of the fibre-enriched and the regular product, for bread, pasta and chocolate milk for informed condition (informed FE-R) and blind condition (blind FE-B).

Conclusions



When displayed on the label, BSG description and sustainability logo captures consumers' attention, and positively impacts their purchase intention of all three products



Eye-tracking technology is a powerful tool to understand which aspects consumers pay more attention to on food labels.



Information (source of dietary fibre and sustainability claims) has a positive impact on consumers perception, making BSG-enriched products as accepted as the regular ones.