Chapter N (please do not write anything in this line. Editors will annotate the chapter number)

Foods Supplements: quality assessment of formulations by expert panel

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**Abstract.** In Europe, food supplements are classified as foodstuffs and regulated by Directive 2002/46/EC. They are a concentrated source of nutrients (e.g., vitamins, amino acids, minerals, etc.) or bioactive compounds extracted from plants or herbs.

The Italian market of food supplements is showing rapid growth, especially through B2C e-commerce. However, it is highly competitive and fragmented. No single company has an adequate influence to lead the industry in a specific direction, and countless formulations are listed in the "National Register of Food Supplements". Quality products can therefore be the key to a competitive advantage.

In this study, the biological-nutritional quality of 22 product formulations of an Italian start-up, MyLab Nutrition Group, was evaluated by a panel of 7 experts recruited through a public competition and led by a coordinator.

The products were compared with the best seller in the category or the standard of care used by the participants, using the Likert scale as a quality indicator.

The average score given by the panel for the products was 3.8 ± 1.1. This result showed that the products of the start-up are highly comparable with those on the market, confirming their competitiveness with the leading Italian brands.

**Keywords.** Food supplement, Quality assessment, Formulation, Expert panel

# Introduction

Consumers are constantly more careful about their health and the well-being of their lives.

The evolution in dietary styles, and now the COVID-19 pandemic, combined with the growing attention of consumers for beneficial and healthy food have accelerated the demand for dietary supplements that improve the immune system, increase physical/mental performance, or supplement the standard diet in general.

According to their dietary role or origin, food supplements can be classified into three main categories: substances with recognized nutritional value; extracts of botanic products; and other substances with physiological effects (Faqi and Yan, 2017).

Statistical data shows that more than 25% of the European population is a food supplement user, this value rises to 59% in the population with specific dietary needs, like e.g., pregnant women (Domínguez et al., 2021).

In Europe, the Directive 2002/46/EC (and subsequent amendments) defines the food supplements as *“foodstuffs the purpose of which is to supplement the normal diet and which are concentrated sources of nutrients or other substances with a nutritional or physiological effect, alone or in combination, marketed in dose form, namely forms such as capsules, pastilles, tablets, pills and other similar forms, sachets of powder, ampoules of liquids, drop dispensing bottles, and other similar forms of liquids and powders designed to be taken in measured small unit quantities”*. The regulation lays down also a full list of minerals and vitamins that can be added to food supplements, and the authorized sources (Directive 2002/46/EC).

The Italian market for food supplements is rapidly growing, especially thanks to B2C e-commerce. It is a highly competitive and fragmented sector (Foresti, Galleri, and Giusti, 2021), and no single company has sufficient influence to lead the industry in a specific direction. Countless formulations are currently listed in the “National Register of Food Supplements” and the pursuit of product quality is the key to a competitive advantage.

In this context, our study proposes an assessment of food supplements produced and selected by an Italian start-up (*MyLab Nutrition Group*). The research outputs must be weighed up against biological-nutritional benefits since the evaluation has no clinical relevance. The Likert scale was used by an expert panel in the field of food supplements to evaluate the formulation of the company’s selected products.

# Methodology

The panel consisted of 7 experts led by a coordinator and recruited through a public competition (Bellizzi et al., 2016). The experts’ profile was as follows: Master’s degree in Human Nutrition Science, biology or food science and technology; membership in the National Order of Biologists; proven experience in the field of food and nutrition (higher than 3 years). The panel coordinator was a professional with a PhD in a relevant field, with a proven experience superior to 5 years in the food and nutrition sector, focused on applied research.

22 products were selected by MyLab Nutrition Group, all already included in its online catalogue, to assess the formulation.

The investigated products are reported in Table 1.

Each panelist evaluated 10 products, according to table 1. The allocation strategy followed the criteria of random assignment, as long as it was possible to have at least 3 repetitions by different panelists for each food supplement.

Each panelist attributed a score from 1 to 5 (Likert scale) to the formulation of the food supplements, also evaluating the differences with the best-seller for that category. Specifically, a score of 1 denoted a complete lack of the necessary requirements of the product formulation; 2 expressed significant deficiencies in the product preparation; 3 represented a sufficient structure, but with some gaps, especially in comparison with the competitors; 4 a good structure; 5 expressed an outstanding assessment (Cheng et al., 2021).

Table 1. Product assignment scheme to each nutrition expert

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No | Food supplement type | Properties | \*P1 | P2 | P3 | P4 | P5 | P6 | P7 |
| 1 | 360 Life Defender | multimineral, multivitamin | X | X | X |  | X |  |  |
| 2 | Articoss Articolaz-Ossa | bones and cartilages maintenance | X | X | X |  |  |  |  |
| 3 | Big B. Expl. Pre-Workout | branched amino acids for intense training | X | X | X |  |  |  |  |
| 4 | Omega 3 Epa + Dha | rich natural Omega-3 source |  |  |  | X | X | X |  |
| 5 | Phoenix Post-Workout | recovery after training |  |  |  | X | X | X |  |
| 6 | Rexiburn Bruciagrassi | body weight control |  |  |  | X | X | X |  |
| 7 | Viking's Recoveri Night | nocturnal muscle recovery | X | X |  |  |  |  | X |
| 8 | Ananas & Bromelina | cellulite treatment | X | X |  |  |  |  | X |
| 9 | Biotinker | well-being of skin and hair | X | X |  |  |  |  | X |
| 10 | Fegadep | liver support and purification |  |  | X | X | X | X |  |
| 11 | Fermacol K | cholesterol level management |  |  | X | X | X |  |  |
| 12 | Flora B-Complex | human microbiome balance |  |  | X | X | X |  |  |
| 13 | Grani Di Herbe | intestinal transit regulation | X |  |  |  |  | X | X |
| 14 | Localdol | contrasts localized tensions | X |  |  |  |  | X | X |
| 15 | Melatofast | relaxation and sleep improvement | X |  |  |  |  | X | X |
| 16 | Mirtillo | urinary tract microcirculation support |  | X | X | X |  |  | X |
| 17 | Nutriserep | normal prostatic function maintenance |  | X | X | X |  |  |  |
| 18 | Papayn Plus | antioxidant and tonic for immune system |  | X | X | X |  |  |  |
| 19 | Seresil Donna | menstrual and menopause disorders |  |  |  |  | X | X | X |
| 20 | Vitalight Detox | body fluids purification and drainage |  |  |  |  | X | X | X |
| 21 | Vitalight Slim | body weight balance |  |  |  |  | X | X | X |
| 22 | Pasithea Relax | relax and sleep promotion | X | X | X | X |  |  |  |

\*P: Panelist

# Results and discussions

The obtained average scores for the products assessed are shown in Figure 1. The overall score was 3.8 ± 1.1 showing an intermediate dispersion of the evaluations. This result is confirmed also by looking at the individual scores. The range varies from 5.0 ± 0.0 of the product *Omega 3 EPA + DHA* to 2.3 ± 1.5 of the food supplement *Seresil Donna.* Ten products obtained an average value ≥ 4.0, while the above-mentioned *Seresil Donna* got a score ≤ 3.0, showing a generally positive evaluation of the producer catalogue.

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Fig. 1. Average score (in Linker scale) for the products assessed. Error bars represent standard deviation. Dash-dotted line represents the overall average score.

The experts were also asked to evaluate the formulations in quali-quantitative terms and to provide remarks on the scores. The comments are summarized in table 2. The suggestions from experts could be a useful tool for producers to improve their product formulation.

Table 2. Expert’s remarks for the product evaluated

|  |  |
| --- | --- |
| Product | Remarks |
| *360 Life Defender* | Interesting product even if the quantity of active ingredients is low, to have greater effectiveness it would be advisable to administer at least 2 tablets / day |
| *Articoss Articolaz-Ossa* | Balanced product also in the dosages of active molecules, components well distributed and all functional for prevention, probably should be assisted with the administration of HMB and omega 3. Suggested increase in the dosage of proline and collagen peptides |
| *Big B. Expl. Pre-Workout* | Balanced product also in the dosages, well distributed components and all functional for prevention, I probably assist it with the administration of HMB and omega 3. Suggested increase in the dosage of proline and collagen peptides |
| *Omega 3 Epa + Dha* |  |
| *Phoenix Post-Workout* | The product has a higher and better-balanced quantity of amino acids for the same weight compared to other products, in addition to the added value given by vitamins and minerals. Creatine content is similar respect to the competitor. The competitor product contains hydroxy-methyl-butyrate, useful for preserving muscle tone and especially sugars, essential for adequate recovery. Phoenix should be combined with another supplement or sugar-rich foods. |
| *Rexiburn Bruciagrassi* | The quantity of garcinia is much lower than the competitor, but it contains many more active ingredients. It is hoped that the quantities of the numerous active ingredients contained in it work synergistically with each other, but there are not enough elements in the literature to validate it. |
| *Viking's Recovery Night* | Product with right components but too low dosage, considering that the main target are athletes. Dosage of: Zinc (15 mg), ac. aspartic (1.5g). In addition, it is desirable to enter vitamin D. |
| *Ananas & Bromelina* | Adequate component/dosage ratio, even if the efficacy of the product is questionable for the intended purpose. |
| *Biotinker* | Vitamin C is missing, and the amount of zinc is too low |
| *Fegadep* | Extract content superior to others available on the market, so it seems like a very good product |
| *Fermacol K* |  |
| *Flora B-Complex* | It looks like a great product. Good combination with vitamin B. |
| *Grani Di Herbe* | Adequate component/dosage ratio; advised addition of agar-agar or physillium |
| *Localdol* | Adequate component/dosage ratio; suggested addition of rhodiola rosea and phosphatidylserine and Devil's Claw or 5HTP |
| *Melatofast* | Adequate component/dosage ratio; 2 tablets/dose recommended |
| *Mirtillo* |  |
| *Nutriserep* | Good product, but it is preferable to recommend taking 2 capsules, 1 in the morning and 1 in the evening. |
| *Papayn Plus* | The sachet formulation involves greater difficulty of administration, the package is 15 and to cover a month it could be assumed from 30. |
| *Seresil Donna* | The supplements targeted for disorders related to the menstrual cycle are generally based on chaste tree or evening primrose oil, principles that are not present the product. |
| *Vitalight Detox* |  |
| *Vitalight Slim* | Synephrine is missing, but it contains a larger amount of caffeine. Given the annoying effects of caffeine abuse, it might be appropriate to diversify the active ingredients (formulate a phytocomplex in order to reduce the amount of caffeine). |
| *Pasithea Relax* | Adequate component / dosage ratio; suggested synergy with Localdol |

Some considered products exhibited a competitive formulation for the intended scope, but the dosage recommended was insufficient (*360 Life Defender, Big B. Expl. Pre-Workout, Rexiburn Bruciagrassi, Viking's Recoveri Night, Melatofast, Nutriserep*). missing critical component for a quality supplement (*Biotinker, Seresil Donna, Vitalight Slim*); others, lacked critical components for a quality supplement (*Biotinker, Seresil Donna, Vitalight Slim*); while, for others still, were just suggested the addition for an overall improvement (*Locadol, Grani di erbe, Phoenix Post-Workout, Big B. Expl. Pre-Workout, Articoss Articolaz-Ossa*). Finally, ~~the~~ experts suggested a synergic use of two products *Pasithea Relax* and *Locadol* opening the way for a new marketing strategy.

# Conclusions and future perspectives

The study aimed to assess the food supplement formulations in quali-quantitative terms produced by an Italian start-up. The Likert scale was used by an expert panel previously constituted to carry out the evaluation of the selected food supplements.

The average score given by the panel for the product set was 3.8 ± 1.1. The results of the study showed that the products of the start-up are highly comparable with those on the market, confirming their competitiveness with the leading Italian brands. However, a few improvements were suggested for some products, and only one product (*Seresil Donna*) was found inappropriate.

Further developments of the research should be focused on one side, on a panel formed of a greater number of experts and, on the other, on the selection of experts for each food supplements category considered.

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