

Participants

The study's power calculation was computed using G*Power (Version 3.1.9.2, University of Kiel, Kiel, Germany) to estimate the sample size. The analyses of T student mean showed that the study needed 22 participants to prove 80% power with a significance level of $\alpha=0.05$ to detect an effect size (d) = 0.55. Twenty-two young males volunteered to participate in this study. Participants were students at the High Institute of Sports and Physical Education of Kef (Tunisia). They were required to meet the following criteria: no history of chronic disease; no smoking, no history of dietary supplements intake or drug consumption within six months before enrolment into the study. All participants provided written consent after being informed of this investigation's aims, benefits, and risks. The experiment was fully approved by the local Ethics Committee of High Institute of Sports and Physical Education of Kef (Tunisia) before the commencement of the assessments. All the procedures were performed in agreement with the Declaration of Helsinki.

Study design

In this double-blind, randomized trial, participants performed two experimental sessions with a one-week washout period. Each participant received either a capsule filled with 300 mg saffron powder (SAF session) or a visually identical capsule filled with 300 mg lactose powder (PLB session). Two hours after ingesting the capsule (Asai et al. 2005; Bathaie et al. 2010), each participant performed the repeated-sprint sets test (RSS) to measure peak time (PT), total time (TT) and fatigue index (FI). Heart rate (HR) was measured before and during the RSS, and blood lactate concentration was measured immediately after this test. Before (Pre) and after (Post) the test, ratings of perceived exertion (RPE) and feeling scale (FS) were also measured. All supplements were blinded and randomized by a separate researcher not involved in the data collection to ensure the double-blind study design. Research Randomizer

(<https://www.randomlists.com/team-generator>), was used to randomly assign subjects to each experimental condition. All subjects were prohibited from consuming any dietary supplements and were instructed to refrain from vigorous physical exercise for at least 24 h before each test session. In addition, all subjects were instructed to consume their habitual dietary. To avoid circadian variation, the two sessions were conducted at the same time of day for each participant (± 1 hour). The study design is shown in Figure 1.

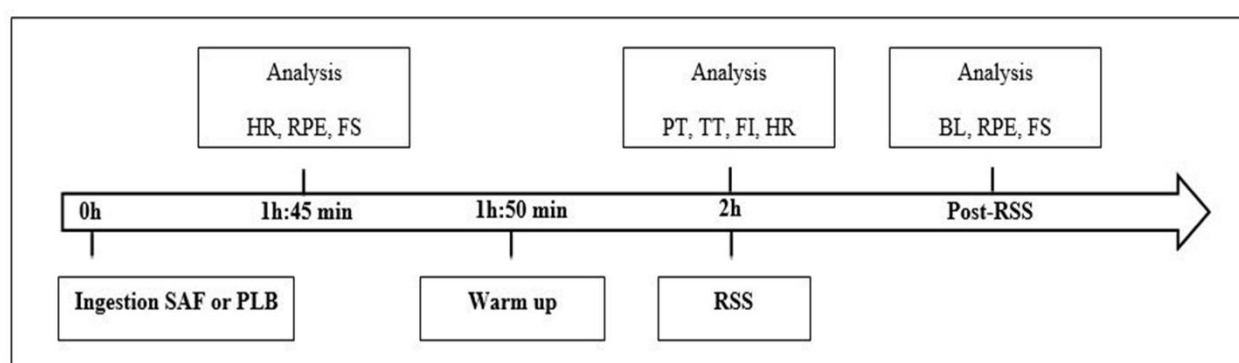


Figure 1. Experimental protocol.

BL, blood lactate; *FI*, fatigue index; *FS*, feeling scale; *HR*, heart rate; *PLB*, placebo; *PT*, peak time; *RPE*, rating of perceived exertion; *RSS*, repeated-sprint ability test; *SAF*, saffron; *TT*, total time.

Repeated-sprint sets test (RSS)

The RSS was performed indoors at the university gymnasium on a synthetic hard floor. The RSS consisted of 2 sets of 5×20 m shuttle sprints, with 15 s of active recovery between repetitions and with 1 min between sets. Each sprint shuttle was performed with one direction change (180° turn) and was timed using a photocell system (Brower Timing System, Salt Lake City, 174 UT, USA; accuracy of 0.01 s), positioned approximately 3 m apart facing each other on each side located at the start and finish lines. Before beginning the tests, participants completed a 15 min standardized warm-up. No verbal encouragement was provided during

the tests. Participants were informed of the sprint number during each set. The following variables were derived from the RSA test: (a) PT: the best time of each RSA test; (b) TT: the sum of all 10-sprint times; (c) the FI: calculated as recommended by Fitzsimons et al. (1993) from sprint running performance using the following formula: $FI (\%) = \left(\frac{TT}{PT * \text{NUMBER OF SPRINT}} - 1 \right) * 100$

Psycho-physiological measures

HR was continuously measured, before and during the RSS test, by an individual heart rate monitor (Polar, Lake Success, NY) with pre (HRpre) and maximum (HRmax) values extracted as outcome variables. The Borg 6-20 scale was selected to rate the perceived intensity of exertion (Borg, 1998) Pre and Post RSS. To assess the participants' mood, we used the FS (Hardy & Rejeski, 1989): FS was measured using the Hardy and Rejeski's bipolar feeling scale. Immediately after the RPE assessments, the participant was asked to respond to the question "How are you feeling right now?" by choosing one on the 11-point scale [from +5 (very good) to -5 (very bad) with a midpoint of 0 (neutral)]. Furthermore, blood lactate levels were assessed using a portable lactate monitor three minutes following the test (Lactate Pro, Akray, Tokyo, Japan).

Statistical analysis

All data were checked for normality using the Kolmogorov-Smirnov test and are presented as means \pm standard deviation (SD). Two-way repeated measures ANOVA (2 sessions [PLB, SAF] * 2 times [pre, post]) were used to compare the RPE and FS between sessions across times. The TT, PT, FI, blood lactate concentration and HR were performed using the paired samples t-test. The effect size (ES) was calculated using the following criteria: ≤ 0.2 , trivial; $>0.2-0.6$, small; $>0.6-1.2$, moderate; $>1.2-2.0$, large; and >2.0 , very large (Cohen, 1988). A

5% significance level was considered in all cases, and the data were analyzed in SPSS version 16.0 for Windows (SPSS Inc., Chicago, Illinois, USA).