

INFLUENCE OF HIGH INTENSITY ULTRASOUND ON PHYSICAL PROPERTIES AND BIOACTIVE COMPONENTS OF BUCKWHEAT HULLS

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INTRODUCTION:

Buckwheat is a pseudocereal with growing popularity in the food industry due to its pleasing nutritive and sensory properties. Buckwheat hulls are a milling by-product of high antioxidant activity, consisting mainly of dietary fibre (91%). The aim of this work was to optimize high intensity ultrasound pretreatment conditions of buckwheat hulls, to obtain buckwheat hulls with enhanced content of total free phenolics, flavonoid rutin, antioxidant activity, increased polyphenol oxidase activity (PPO), and water swelling capacity.

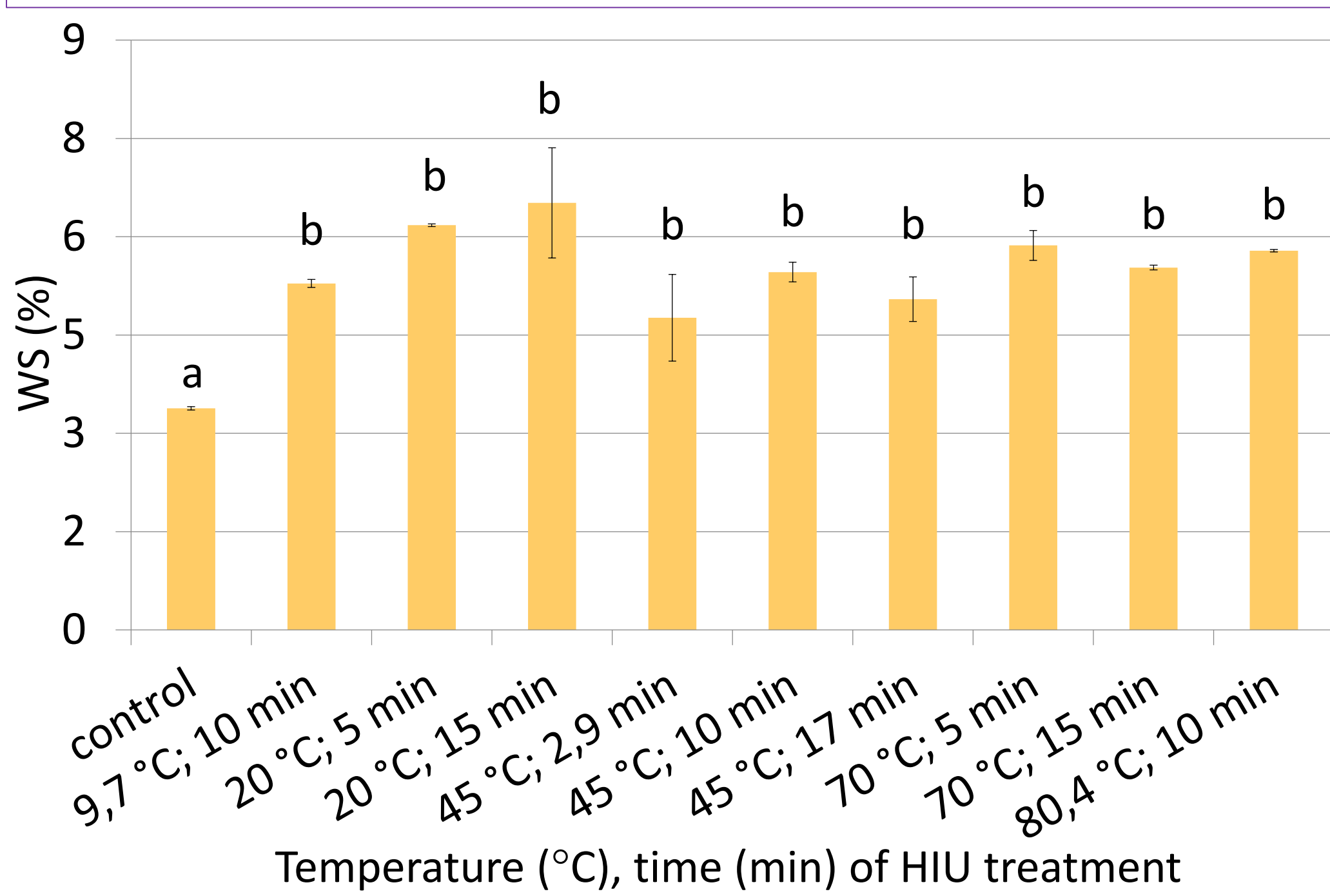


Fig. 1. HIU and heating effect on water swelling (WS) of buckwheat hulls

MATERIALS & METHODS:

CRYOMILING of samples

to size <u>50 μm</u>

FOR IMPROVEMENT OF:

- TOTAL PHENOLIC CONTENT (Folin-Ciocalteu method);
 - RUTIN CONTENT (HPLC);
- ANTIOXIDANT ACTIVITY (DPPH & FRAP test);
 - PPO ACTIVITY (AACC 22-85.01);
- WATER SWELLING CAPACITY (Robertson *et al*, 2000)

HIGH INTENSITY ULTRASOUND TREATMENT:
of a 15% water suspension
Central Composite Design
13 experiments with 5 replications of the central point, 100% amplitude, VARYING:
Time of treatment: 5 min, 10 min, 15 min
initial sample temperatures 20 °C, 45 °C, or 70 °C

DISCUSSION AND RESULTS:

Increased water swelling indicates improved capacity for reduction of blood cholesterol while polyphenol oxidase catalyzes protein crosslinking and could therefore be beneficiary to formation of the protein network in gluten-free bakery products, and fibre enriched bakery products in general. All treatments resulted in the same sample temperature at the end of treatment, and therefore, heating of the sample was not a determinant factor. Optimization result showed that, compared to the untreated sample, the best HIU treatment, with the desirability of 0,76, was the one lasting 15 minutes with initial sample temperature 20 °C. It caused a significant increase of the water swelling capacity (93%), polyphenol oxidase activity (114%), and antioxidant capacity (DPPH test 47%, FRAP test 26%) of buckwheat hulls. Amounts of and rutin (26 mg/100 g d.w.) were similar to ones found in whole buckwheat flour. A 6 min HIU treatment at 20 °C caused an increase of rutin content by 6%, but otherwise, as with the total phenolics (180 GAE mg/100 g d.w.) remained unchanged in dependence of HIU treatment parameters and temperature change.

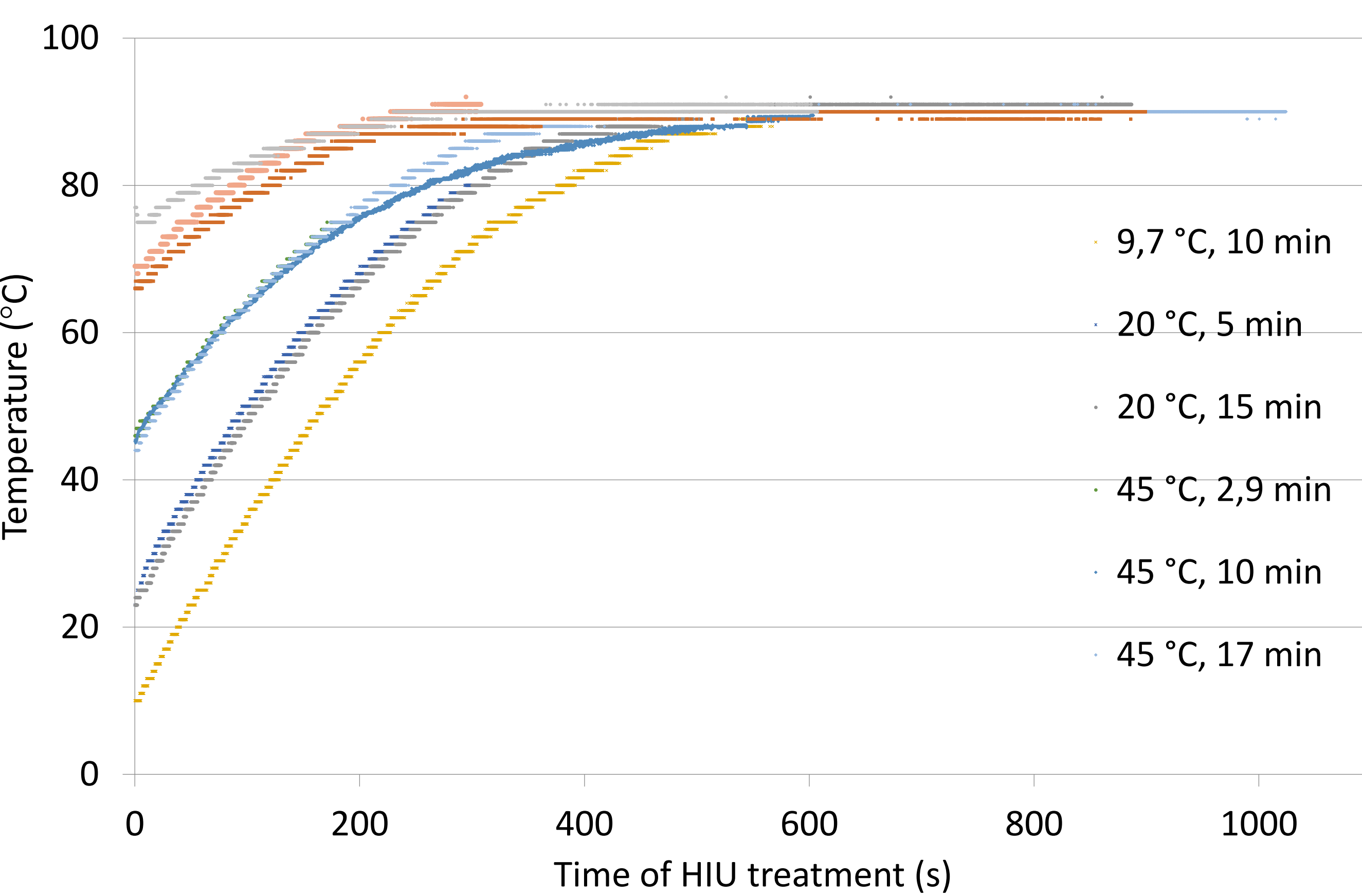


Fig. 2. Temperature kinetics of the HIU treatment of buckwheat hulls

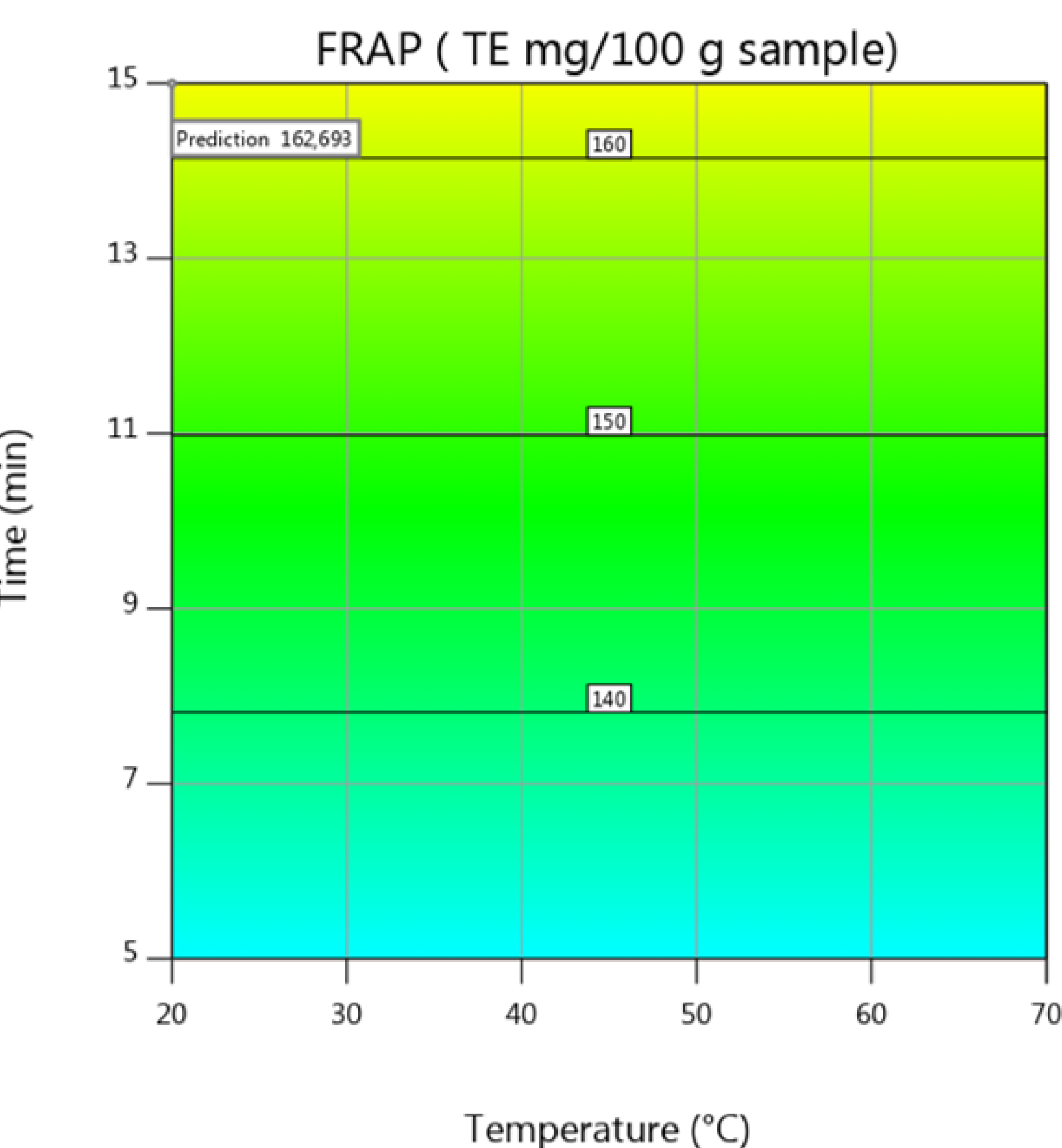


Fig. 3. HIU and heating effect on antioxidant activity of buckwheat hulls measured by FRAP test

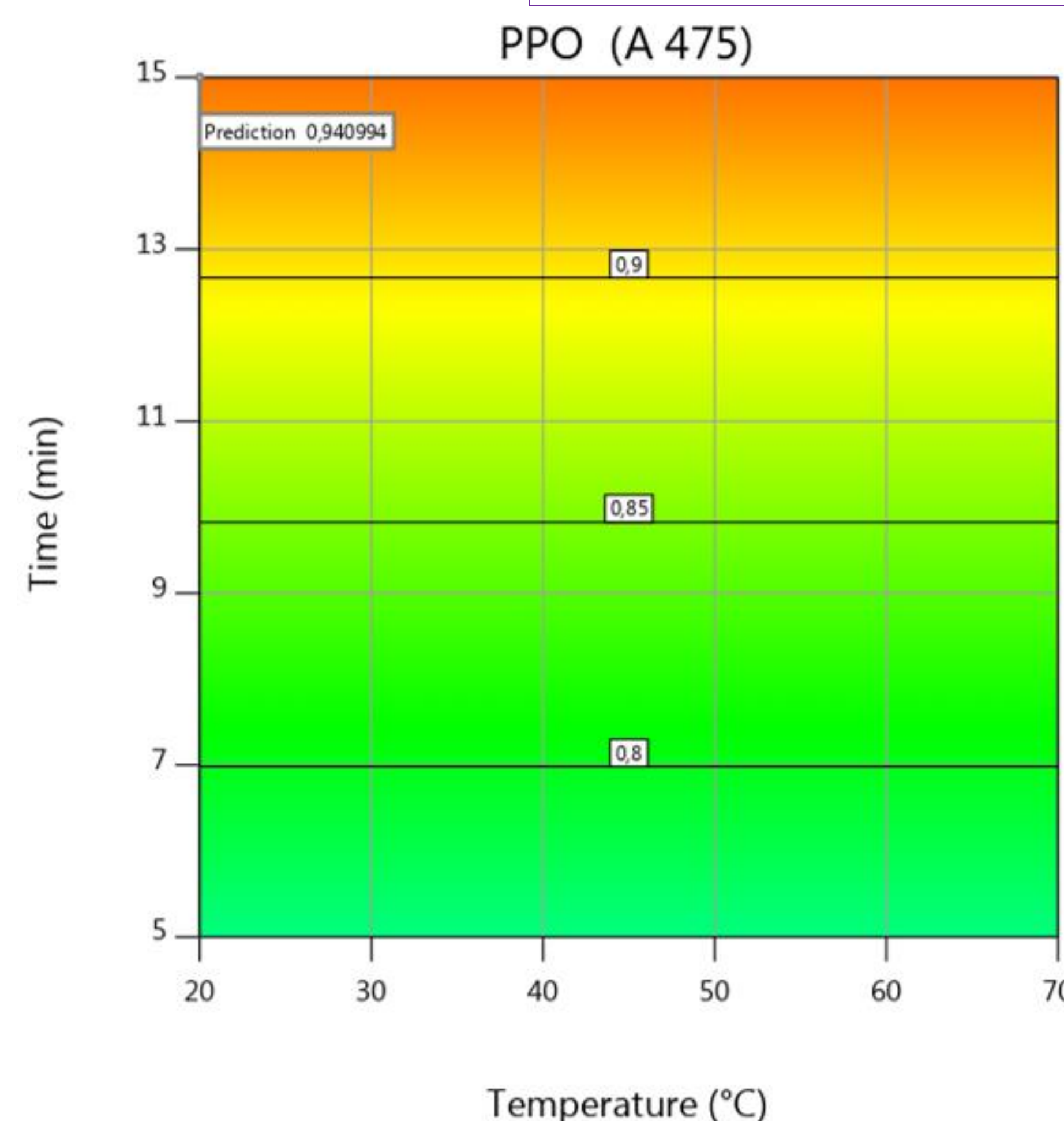


Fig. 4. HIU and heating effect on PPO activity of buckwheat hulls

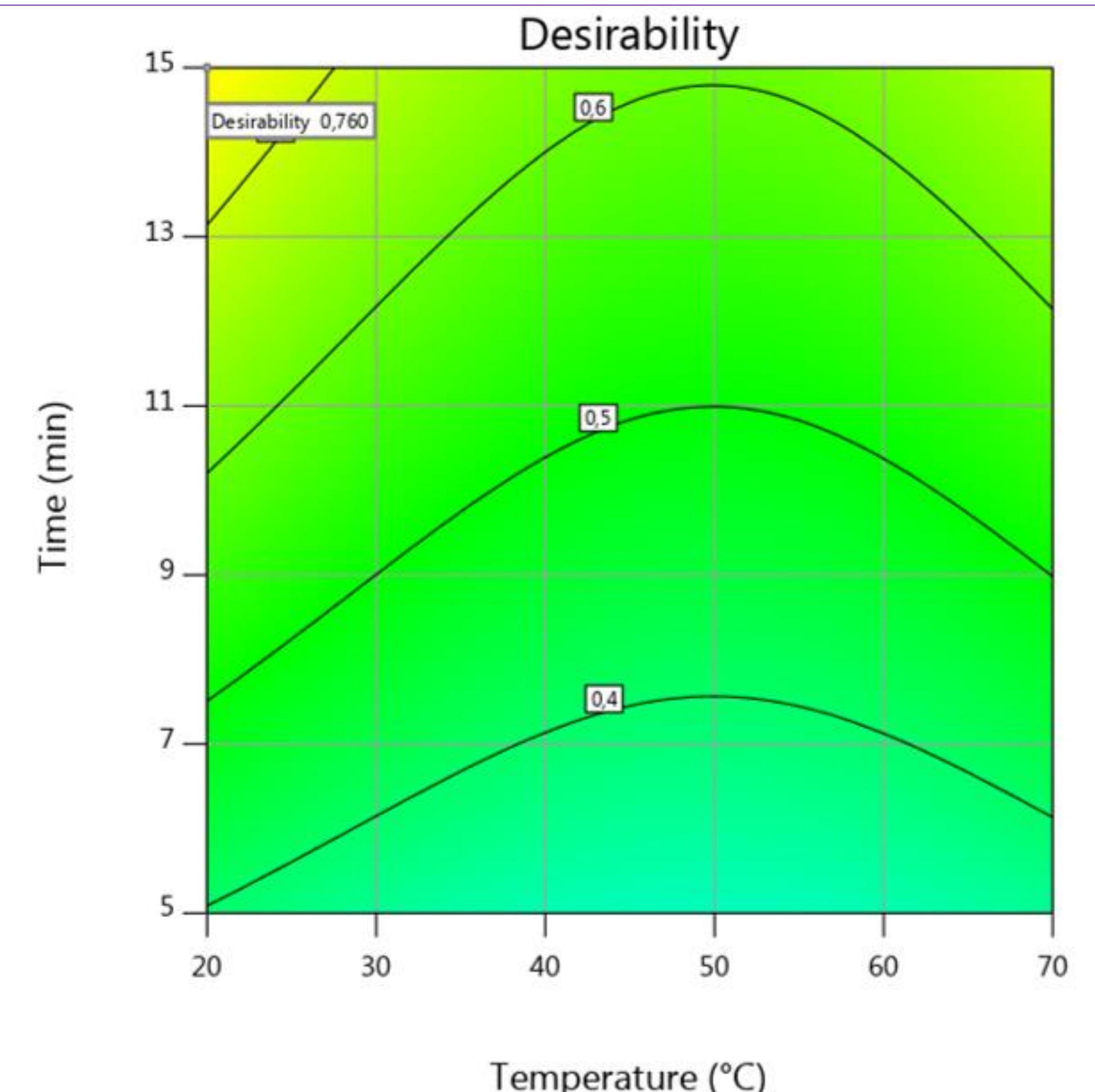


Fig. 5. HIU and heating effect on desirability of HIU treatment of buckwheat hulls