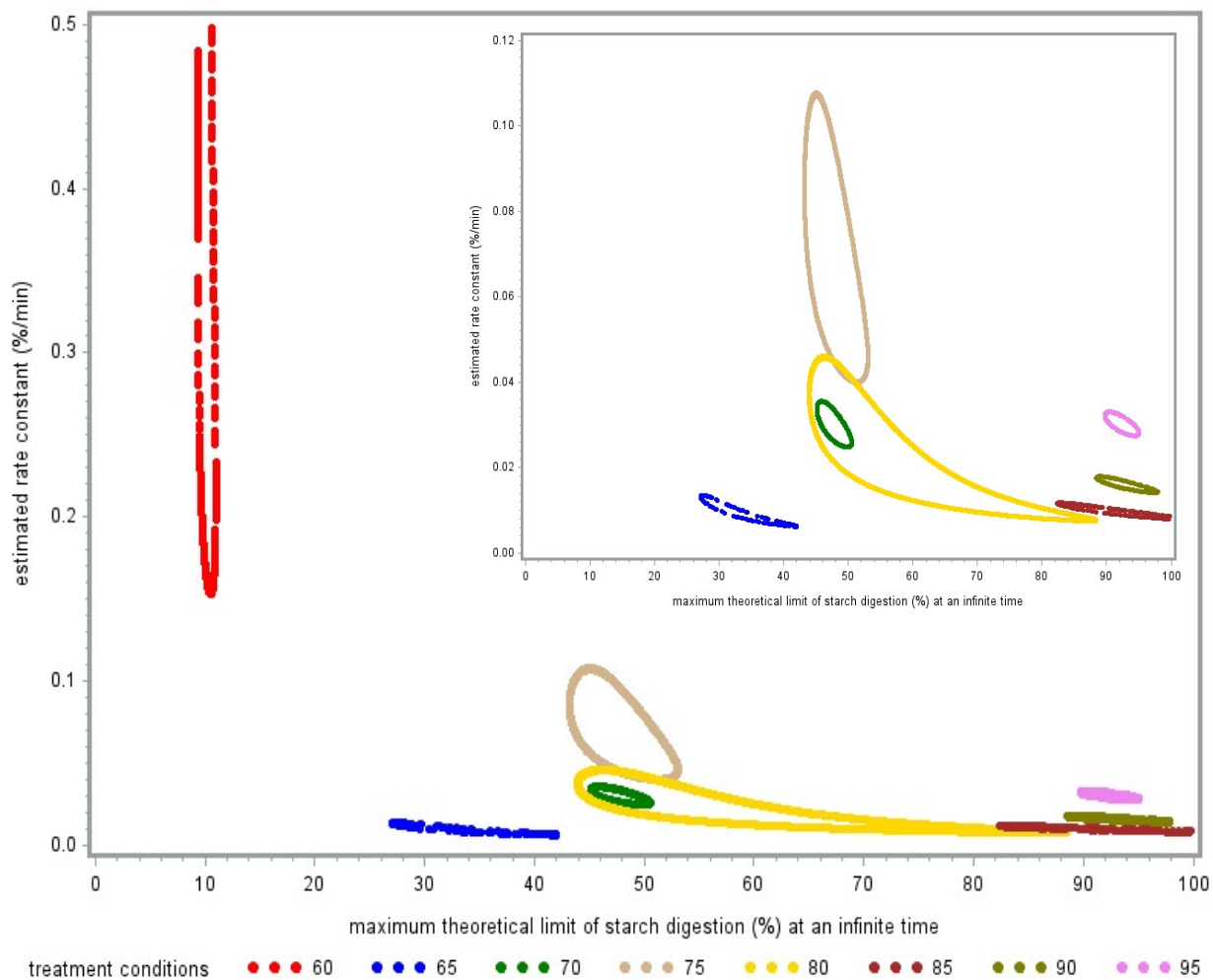


## Supplementary materials



**Supplementary Figure 1:** Joint confidence regions (based on 90% confidence) for rate constant ( $k$ ) and maximum theoretical limit of digestion (%) at an infinite digestion time ( $C_j$ ) of starch digestion during small intestinal digestion, data modelled using Equation 5.

**Supplementary Table 1:** Biphasic model and parameter estimates predicting the starch digestion kinetics for all treatment conditions used.

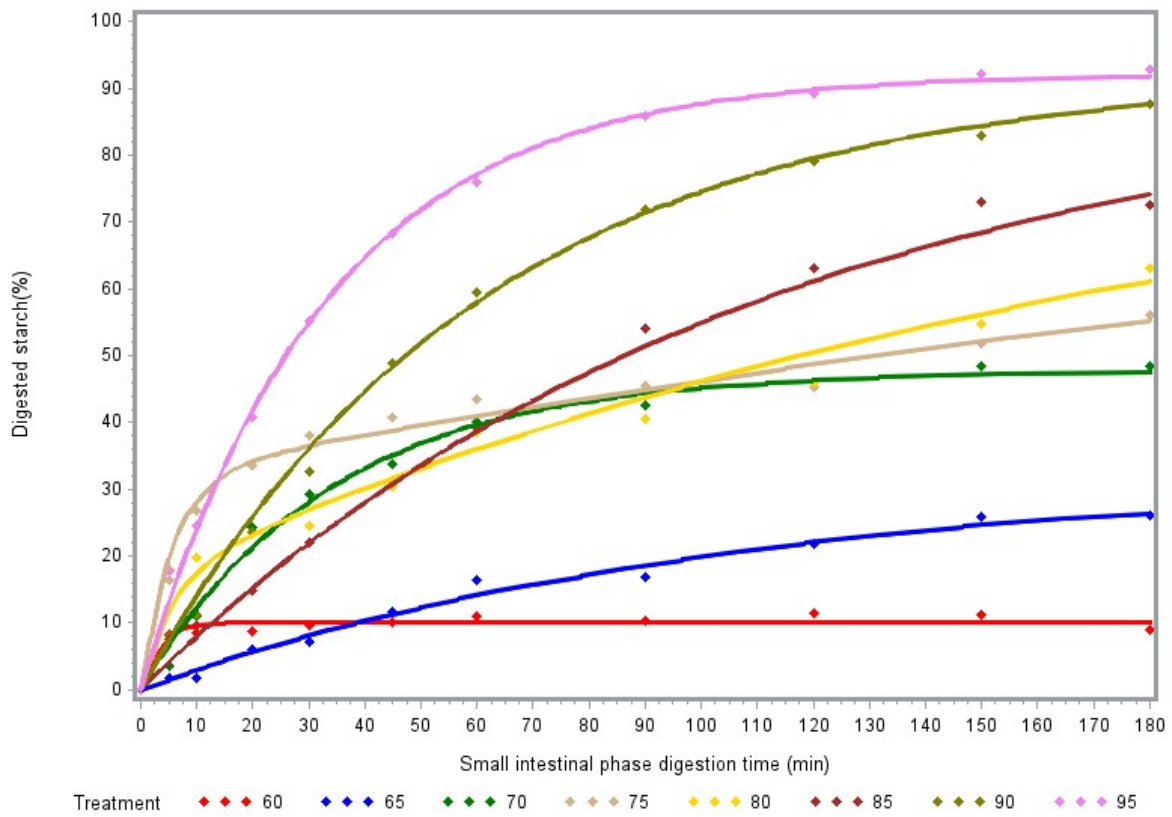
Model equation:

$C_t = C_{f1T} * (1 - e^{-k_{1T} * t}) + (C_{f2} - C_{f1T}) * (1 - e^{-k_2 * t})$ <p>With</p> $k_2 = k_{PE} * e^{k_{exp} * T}$	<b>Eq. 6</b>
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Model parameter estimates:

Parameter	Description and units	Parameter value estimated and standard error
$C_{f160}$	Maximum theoretical limit of starch digestion (%) at an infinite digestion time in the small intestine, during the first phase after a treatment at 60°C (in %)	10.12 ± 0.69
$C_{f165}$	Maximum theoretical limit of starch digestion (%) at an infinite digestion time in the small intestine, during the first phase after a treatment at 65°C (in %)	32.25 ± 4.58
$C_{f170}$	Maximum theoretical limit of starch digestion (%) at an infinite digestion time in the small intestine, during the first phase after a treatment at 70°C (in %)	47.26 ± 1.20
$C_{f175}$	Maximum theoretical limit of starch digestion (%) at an infinite digestion time in the small intestine, during the first phase after a treatment at 75°C (in %)	31.96 ± 1.07
$C_{f180}$	Maximum theoretical limit of starch digestion (%) at an infinite digestion time in the small intestine, during the first phase after a treatment at 80°C (in %)	16.55 ± 1.64
$k_{160}$	Rate constant of digestion of first phase at 60°C ( <b>min<sup>-1</sup></b> )	0.293 ± 0.16
$k_{165}$	Rate constant of digestion of first phase at 65°C ( <b>min<sup>-1</sup></b> )	0.0097 ± 0.003
$k_{170}$	Rate constant of digestion of first phase at 70°C ( <b>min<sup>-1</sup></b> )	0.0297 ± 0.002
$k_{175} = k_{180}$	Rate constant of digestion of first phase at 75 and 80°C ( <b>min<sup>-1</sup></b> )	0.175 ± 0.024
$C_{f2}$	Maximum theoretical limit of starch digestion (%) at an infinite digestion time after the second phase (in %), independent of temperature from 75-95°C	92.32 ± 1.00
$k_{PE}$	Pre-exponential factor of exponential equation relating the rate constant of digestion of second phase with treatment temperature ( <b>min<sup>-1</sup></b> )	3.25 10 <sup>-7</sup> ± 0.87 10 <sup>-7</sup>
$k_{exp}$	Exponential factor in equation relating the rate constant of digestion of second phase with treatment temperature ( <b>°C<sup>-1</sup></b> )	0.120 ± 0.003
$R^2$ adjusted		0.99

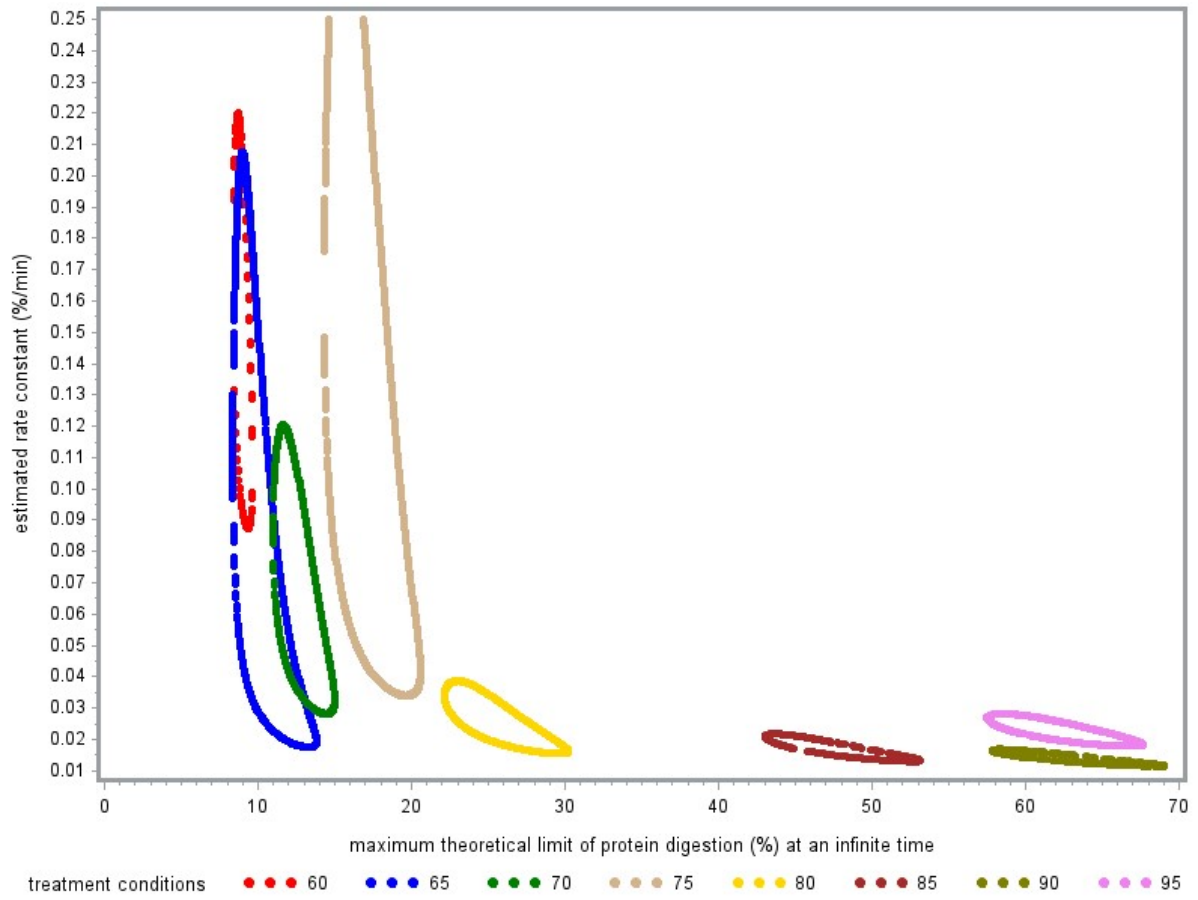
$T$  represents the treatment temperature in °C and  $t$  represents the small intestinal digestion time in minutes.



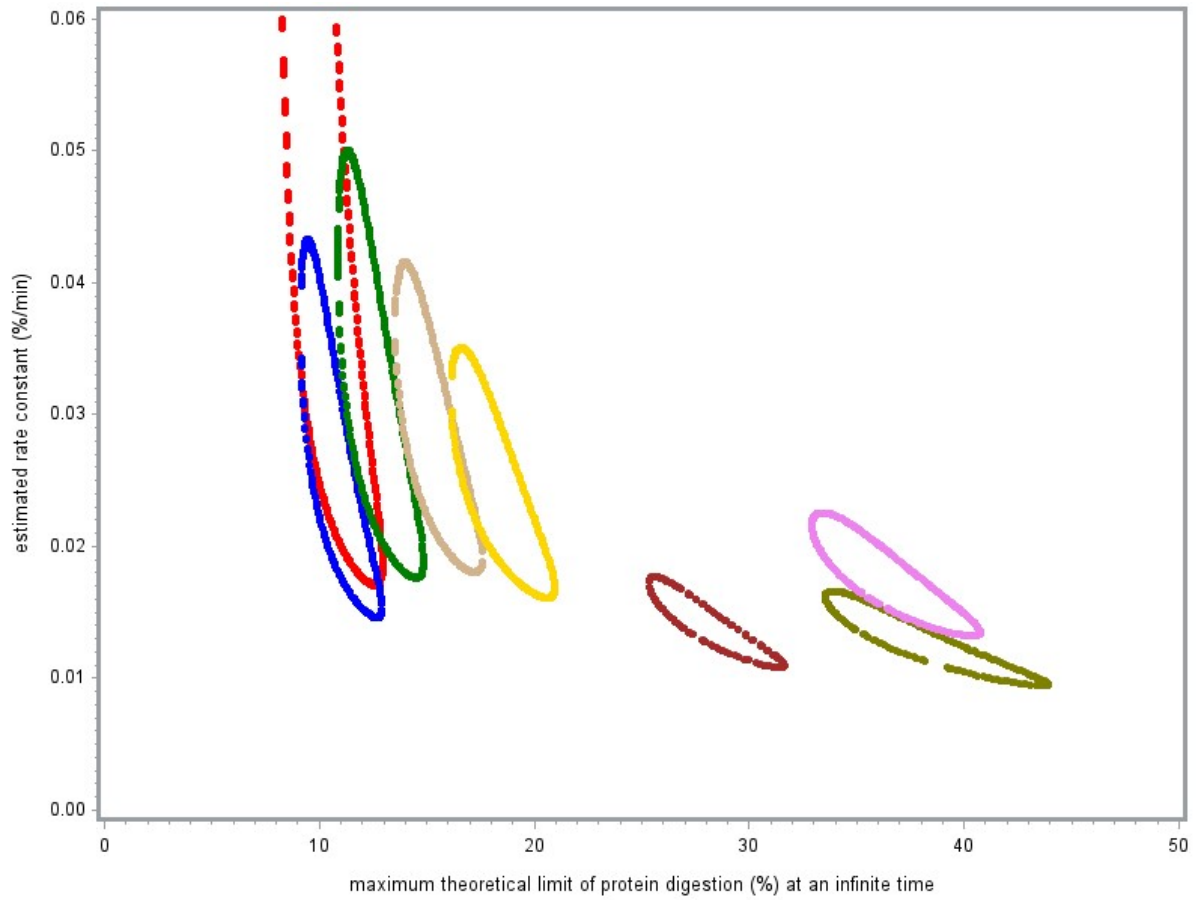
**Supplementary Figure 2:** Static *in vitro* starch digestion kinetics (in the small intestinal phase) of cotyledons from common beans hydrothermally processed in deionized water at different temperatures for 90 minutes. The symbols represent the experimental values whereas the continuous lines represent the predicted values using a biphasic model as described in Supplementary Table 1 (Equation 6).

**Supplementary Table 2:** Total soluble protein and readily bioaccessible protein at the end of the gastric phase (small intestinal phase digestion time of 0 min).

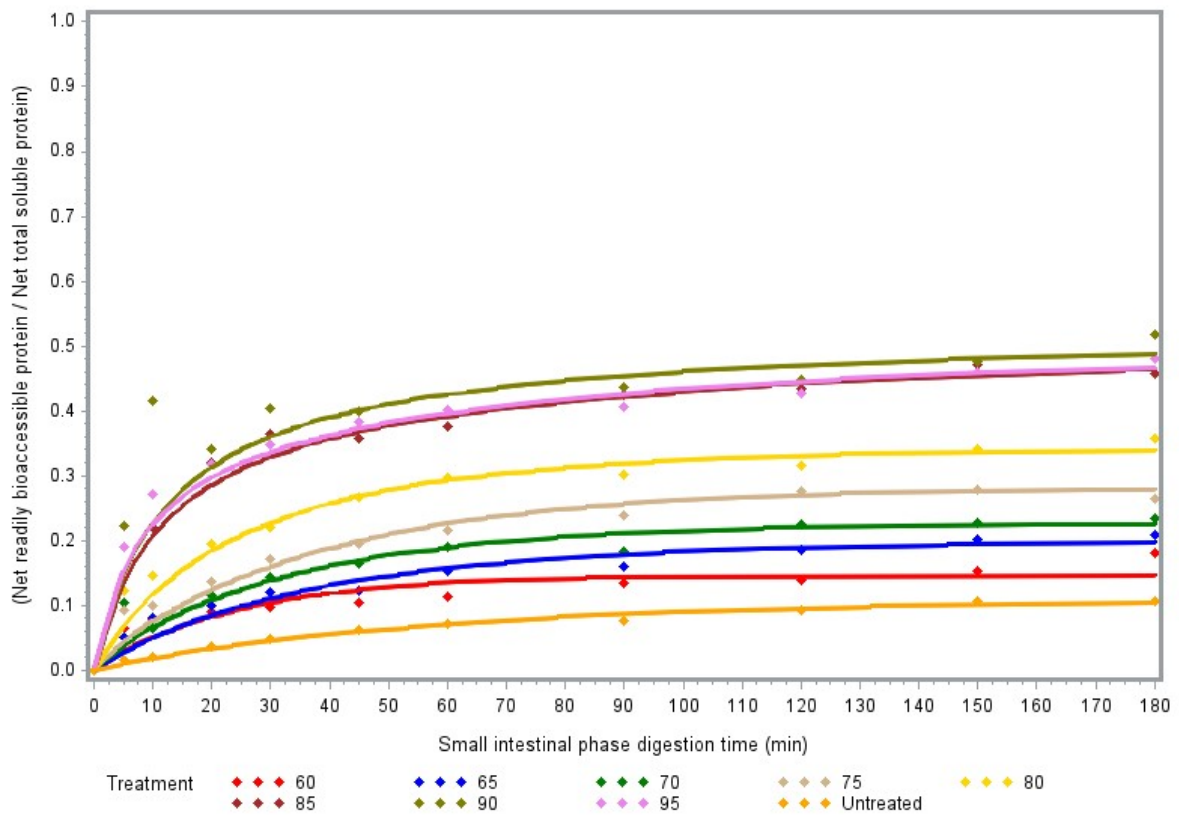
Treatment temperature (°C)	Total soluble protein (%)	Readily bioaccessible protein (%)
60	59.8 ± 0.1	7.4 ± 0.2
65	42.8 ± 0.5	4.5 ± 0.2
70	42.6 ± 1.3	4.0 ± 0.1
75	37.4 ± 0.6	4.5 ± 0.2
80	27.6 ± 0.1	4.1 ± 0.1
85	10.3 ± 1.2	3.6 ± 0.1
90	11.8 ± 0.7	4.4 ± 0.1
95	13.4 ± 0.1	5.6 ± 0.5



**Supplementary Figure 3:** Joint confidence regions (based on 90% confidence) for rate constant ( $k$ ) and the maximum theoretical limit of protein digestion (%) at an infinite digestion time ( $C_p$ ) of the net increase of the total soluble proteins during small intestinal digestion, data modelled using Equation 5.



**Supplementary Figure 4:** Joint confidence regions (based on 90% confidence) for rate constant ( $k$ ) and the maximum theoretical limit of starch digestion (%) at an infinite digestion time ( $C_f$ ) of the net increase of readily bioaccessible proteins during small intestinal digestion, data modelled using Equation 5.



**Supplementary Figure 5:** Ratio of the net readily bioaccessible protein over the net total soluble protein during static *in vitro* protein digestion kinetics (in the small intestinal phase) of cotyledons from common beans hydrothermally processed in deionized water at different temperatures for 90 minutes. The symbols represent the ratio based on experimental values whereas the continuous lines represent the ratio calculated based on the predicted values (presented in figures 6 and 7). Data modelled using Equation 5