

Metabolic and Physiological Responses by New Zealand Blackcurrant during Cycling: A Dose-Response Study

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ABSTRACT

New Zealand blackcurrant (NZBC) is high in anthocyanin content. Seven days of 300 mg/d NZBC extract decreased the respiratory exchange ratio during 10 min cycling bouts. Dose effects of NZBC on metabolic and physiological responses during prolonged endurance exercise are unknown. PURPOSE: To examine the dose-dependent effect of NZBC extract on the metabolic and physiological responses during 120 minutes cycling at a constant power at ~65% VO₂max. METHODS: Fifteen trained male cyclists (mean±SD, age: 38±12 years, height: 178±5 cm, body mass: 76±10 kg, VO₂max: 56±8 mL·kg⁻¹·min⁻¹), maximum minute power: 378±55 W) completed four 120-minute cycling bouts on an electronically braked ergometer (SRM ergometer, SRM International). A counterbalanced Latin-square design assigned the order of four experimental visits (0, 300 (i.e. one capsule), 600 or 900 mg/d NZBC extract). Supplements (CurraNZ, Health Currancy Ltd, UK; each capsule contains 35% spray-dried anthocyanin concentrate) were provided for 7-days with 14-day washout periods. Dietary intake was controlled with food diaries for the 48 hours before each visit. Indirect calorimetry techniques were used at 15 min intervals with continuous heart rate recording and analysed with a one-way repeated measures ANOVA with significance accepted at *p*<0.05. RESULTS: A dose effect was observed for the RER (0: 0.86±0.04; 300: 0.85±0.03; 600: 0.84±0.03; 900: 0.84±0.03) with Bonferroni post hoc testing showing a 2.49% and 2.48% decrease in RER for 600 and 900 mg/d NZBC, respectively. NZBC had no effect on oxygen consumption (0: 63.9±3.9; 300: 64.6±4.3; 600: 64.8±3.7; 900: 64.4±3.5 %VO₂max), heart rate (0: 135±13; 300: 135±14; 600: 135±12; 900: 138±16 beats·min⁻¹) or cycling economy (0: 11.4±2.1; 300: 11.5±2.0; 600: 11.5±2.0; 900: 11.5±2.1 mL·kg⁻¹·W⁻¹). CONCLUSION: New Zealand blackcurrant extract for 7-days demonstrated a dose-response effect on the respiratory exchange ratio during cycling at ~65% VO₂max in endurance-trained athletes with the change suggesting enhanced fat oxidation. Further research is needed to establish whether there is a dose effect of New Zealand blackcurrant on endurance performance.

INTRODUCTION

New Zealand blackcurrant is high in anthocyanin content. Seven days of 300 mg·day⁻¹ New Zealand blackcurrant extract (containing 105 mg of anthocyanin) decreased the respiratory exchange ratio (i.e. RER) during cycling bouts of 10 minutes in trained cyclists (Cook *et al.*, 2015).

AIM

To examine dose-response effects of 7 days of New Zealand blackcurrant extract on metabolic and physiological responses during 120 minutes cycling at a constant power of ~65%VO₂max.

METHODS

Fifteen male cyclists (>3rs experience; mean±SD; age: 38±12 years; height: 178±5 cm; body mass: 76±10 kg; VO₂max: 56±8 mL·kg⁻¹·min⁻¹), maximum power: 378±55 W) completed four 120-minute cycling bouts on an electronically braked ergometer (SRM ergometer SRM International, Germany).



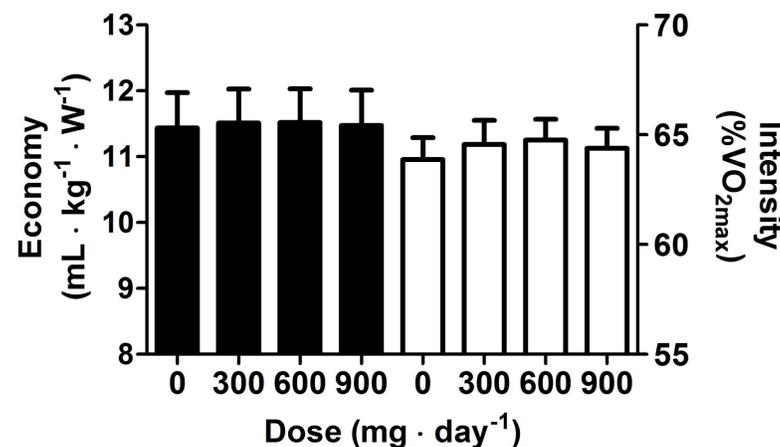
CurraNz

A Latin square design assigned the order of experimental visits. Participants were tested following 7 days intake of either 0, 300, 600 or 900 mg·day⁻¹ New Zealand blackcurrant extract (CurraNZTM, Health Currancy Ltd, UK) containing 0, 105, 210 and 315 mg·day⁻¹ of anthocyanins, respectively. Between each visit, there was a 14 day wash-out. Dietary intake before visits was controlled with a 48 hour food diary and analysed (Nutritics LTD, Dublin, Ireland). Respiratory exchange ratios were obtained from expired air analysis every 15 minutes collected in Douglas bags. One-way repeated measures ANOVA with Bonferroni post-hoc tests were used for analysis with significance accepted at *P*<0.05 (indicated by *).

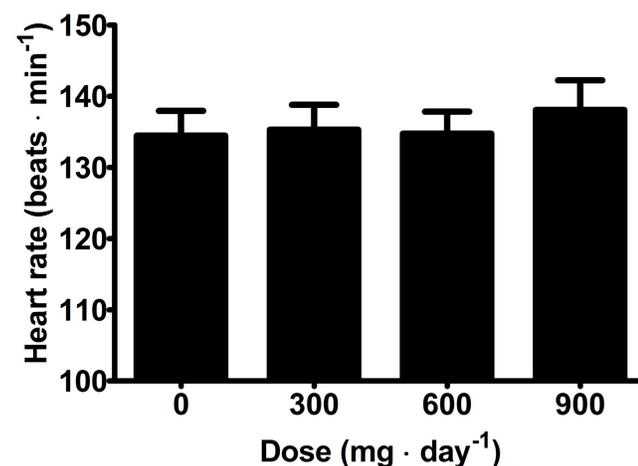
RESULTS

	0 mg·day ⁻¹	300 mg·day ⁻¹	600 mg·day ⁻¹	900 mg·day ⁻¹
Carbohydrate (g)	494±91	495±90	479±85	490±101
Fats (g)	228±68	228±68	230±65	235±73
Protein (g)	216±59	221±58	217±56	220±60
Total energy Intake (kJ)	20654±2950	20804±3080	20724±2805	20709±2835

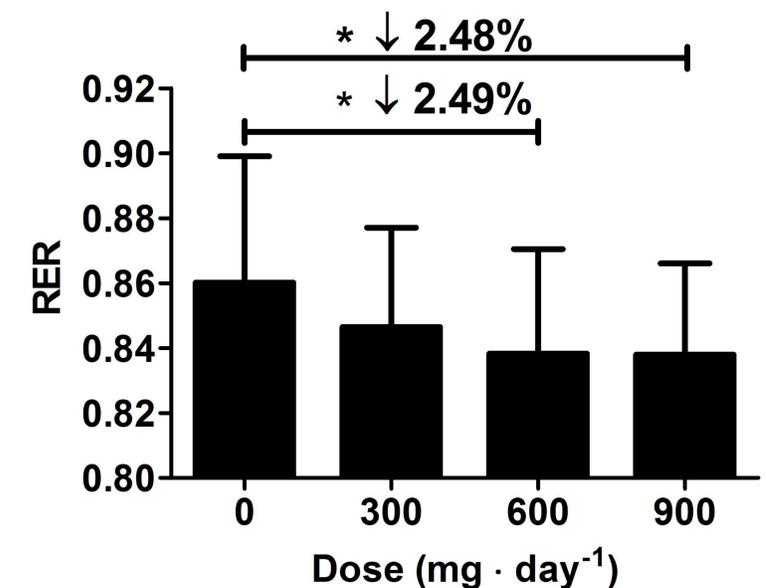
Dietary intake for each dose condition was similar



During 2 hours of cycling at a constant power of ~65% VO₂max, New Zealand blackcurrant extract had no effect on cycling economy, oxygen consumption or heart rate.



RESULTS CONTINUED



During 2 hours cycling at a constant power of ~65%VO₂max, New Zealand blackcurrant extract decreased RER in a dose-dependent manner by 2.49% and 2.48% for 600 and 900 mg·day⁻¹.

CONCLUSION

The decrease in respiratory exchange ratio during cycling at ~65% VO₂max in trained cyclists by intake of New Zealand blackcurrant extract for 7 days was dose-dependent with the change indicating enhanced fat oxidation.

APPLICATION

Increased fat oxidation from New Zealand blackcurrant extract intake may enhance endurance performance. Our findings may have implications for nutritional strategies by endurance athletes.

REFERENCE

Cook, M.D., Myers, S.D., Blacker, S.D., Willems, M.E.T (2015). New Zealand blackcurrant extract improves cycling performance and fat oxidation in cyclists. *European Journal of Applied Physiology*, 115, 2357-2365.

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