

# Application of Multivariate Regression and Artificial Neural Network Modelling for Prediction of Physicochemical Properties of Grape-Skin Compost

Tea Sokač Cvetnić <sup>1</sup>, Korina Krog <sup>1</sup>, Davor Valinger <sup>1</sup>, Jasenka Gajdoš Kljusurić <sup>1,\*</sup>, Maja Benković <sup>1</sup>, Tamara Jurina <sup>1</sup>, Tamara Jakovljević <sup>2</sup>, Ivana Radojčić Redovniković <sup>1</sup> and Ana Jurinjak Tušek <sup>1</sup>

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<sup>1</sup> Faculty of Food Technology and Biotechnology, University of Zagreb, Pierottijeva 6, 10 000 Zagreb, Croatia; tsokac@pbf.hr (T.S.C.); kkrog@pbf.hr (K.K.); davor.valinger@pbf.unizg.hr (D.V.); maja.benkovic@pbf.unizg.hr (M.B.); tamara.jurina@pbf.unizg.hr (T.J.); irredovnikovic@pbf.hr (I.R.R.); ana.tusek.jurinjak@pbf.unizg.hr (A.J.T.)

<sup>2</sup> Croatian Forest Research Institute, Cvjetno naselje 41, 10 450 Jastrebarsko, Croatia; tamaraj@sumins.hr

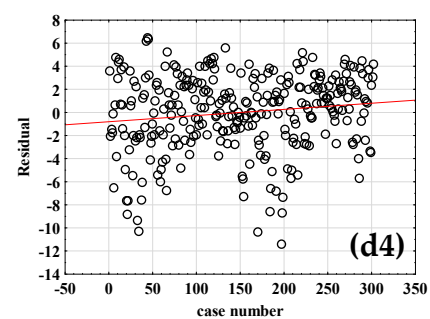
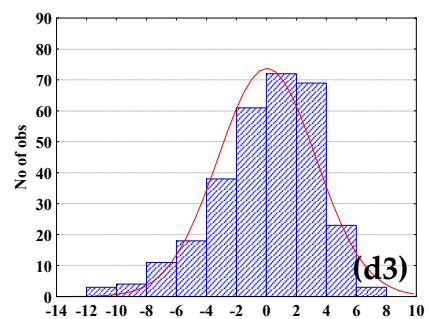
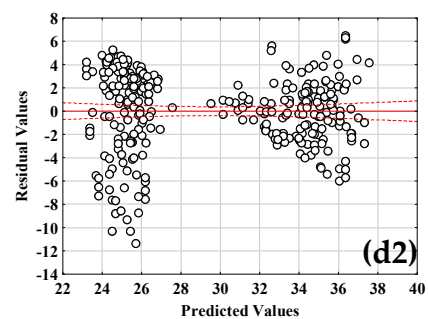
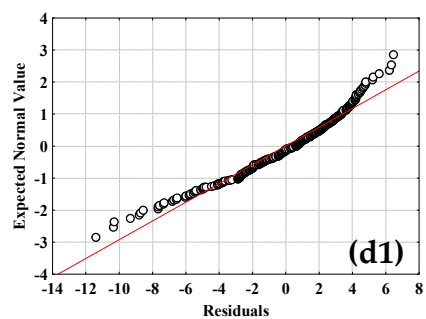
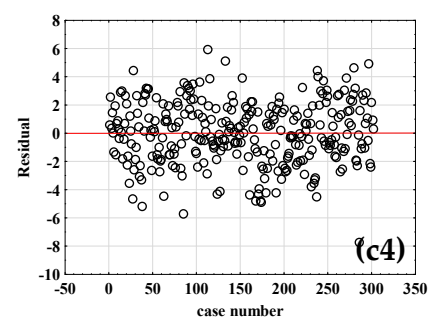
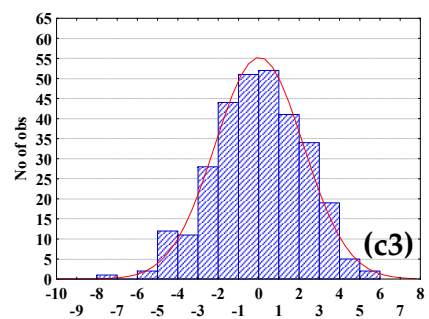
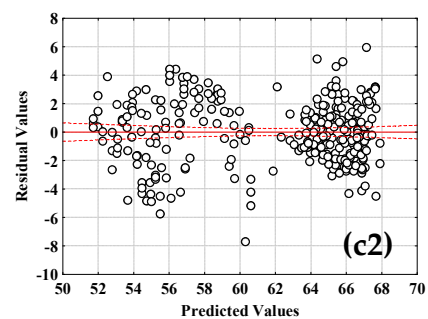
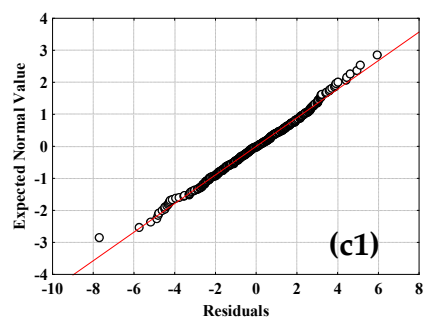
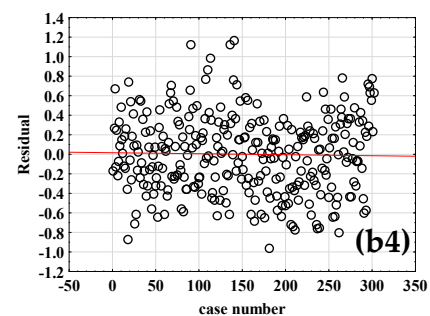
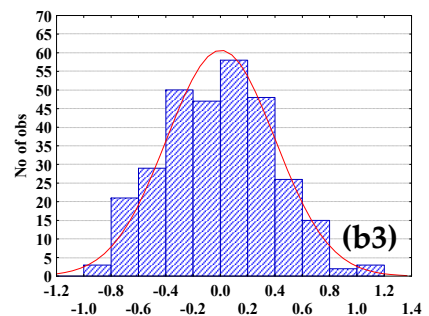
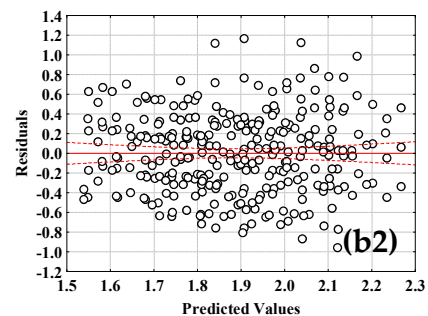
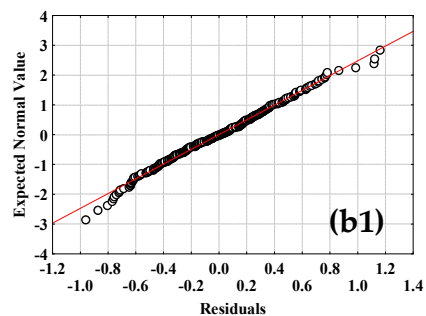
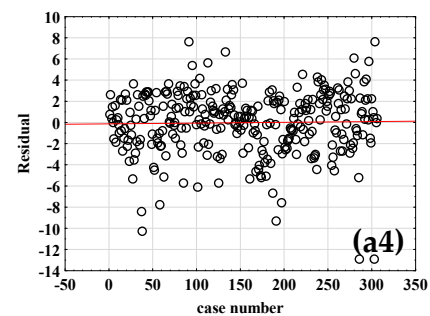
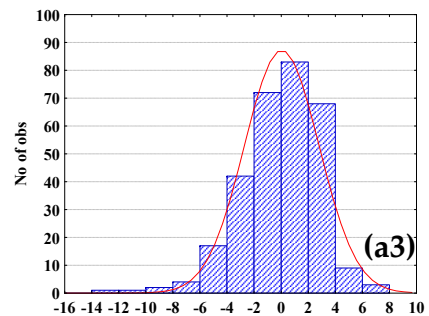
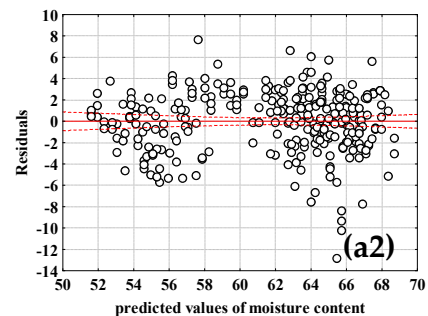
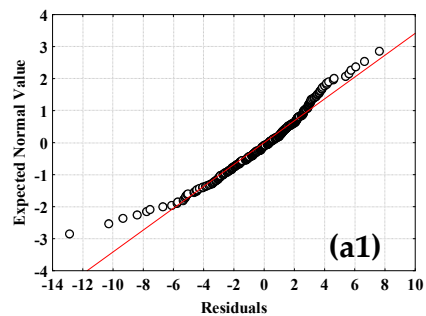
\* Correspondence: jasenka.gajdos@pbf.unizg.hr

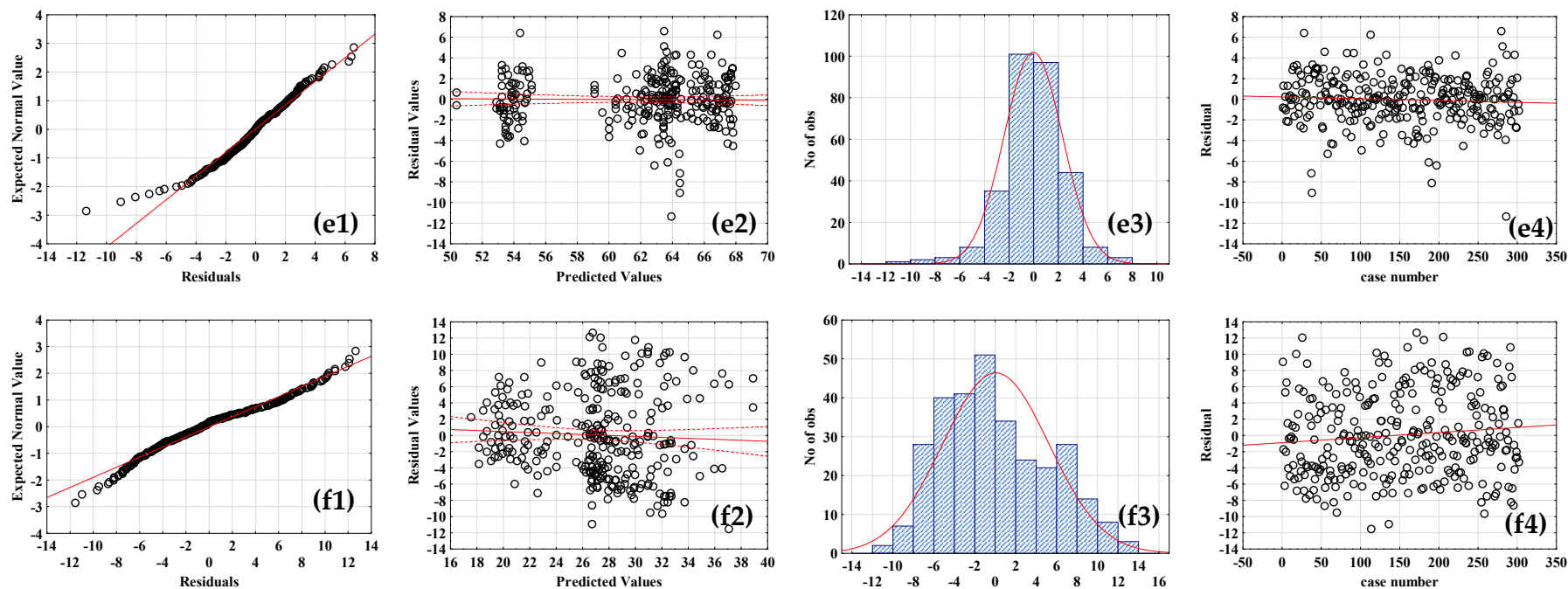
## Supplementary Materials

**Table S1.** Coefficients and statistics of multiple linear regression models for prediction of physicochemical properties of compost during the composting process based on initial moisture content, air flow rate, sampling day. Significant coefficients and standard errors (SE) are marked bold.

Output variable	Coeff.	Coefficient ± SE	Calibration					Prediction					
			$R_{cal}^2$	$R_{cal}^2_{adj}$	RMSE	F-value	p-value	$R_{pred}^2$	$R_{pred}^2_{adj}$	RMSEP	SEP	RPD	RER
Moisture content	$b_0$	-5.787±2.514											
	$b_1$	1.086±0.041	0.779	0.777	2.772	268.180	p<0.001	0.738	0.738	2.781	0.245	1.948	7.274
	$b_2$	1.577±0.304											
	$b_3$	0.182±0.018											
Dry matter	$b_0$	105.787±2.514											
	$b_1$	-1.086±0.041	0.779	0.777	2.772	268.183	p<0.001	0.738	0.738	2.781	0.245	1.948	7.274
	$b_2$	-1.577±0.304											
	$b_3$	-0.182±0.018											
Organic matter	$b_0$	103.767±4.004											
	$b_1$	-0.452±0.066	0.489	0.484	4.473	63.451	p<0.001	0.422	0.408	4.735	0.417	1.314	5.883
	$b_2$	-2.251±0.484											
	$b_3$	-0.327±0.028											
Ash content	$b_0$	-3.767±1.004											
	$b_1$	0.452±0.065	0.489	0.484	4.473	63.451	p<0.001	0.428	0.415	4.648	0.409	1.321	5.991
	$b_2$	2.251±0.485											
	$b_3$	0.327±0.029											
Carbon content	$b_0$	53.562±1.175											
	$b_1$	-0.065±0.019	0.361	0.352	1.242	19.053	p<0.001	0.321	0.305	1.359	0.119	1.177	6.034
	$b_2$	-0.729±0.142											
	$b_3$	-0.041±0.008											
Nitrogen content	$b_0$	1.409±0.352											
	$b_1$	0.001±0.005	0.158	0.149	0.424	18.667	p<0.001	0.123	0.102	0.583	0.051	0.806	3.789
	$b_2$	0.150±0.042											
	$b_3$	0.016±0.003											
C/N ratio	$b_0$	34.162±5.302											
	$b_1$	-0.016±0.087	0.171	0.162	6.056	20.492	p<0.001	0.128	0.107	6.738	0.593	1.065	4.575
	$b_2$	-1.952±0.642											
	$b_3$	-0.272±0.038											
ΔE (compost)	$b_0$	12.170±3.022											
	$b_1$	-0.059±0.049	0.289	0.281	3.331	37.693	p<0.001	0.271	0.253	3.444	0.303	1.207	4.919
	$b_2$	-2.182±0.364											

	$b_3$	0.208±0.023											
pH	$b_0$	2.713±0.773											
	$b_1$	0.054±0.013	0.447	0.441	0.883	80.228	<0.001	0.391	0.376	0.915	0.081	1.278	5.167
	$b_2$	0.289±0.093											
	$b_3$	0.081±0.006											
TDS	$b_0$	523.463±278.832											
	$b_1$	1.231±0.0457	0.422	0.416	318.47	72.403	<0.001	0.396	0.382	342.322	30.139	1.275	5.308
	$b_2$	223.603±33.762											
	$b_3$	25.896±2.007											
S	$b_0$	1460.037±566.110											
	$b_1$	-3.969±0.929	0.412	0.406	646.60	69.490	<0.001	0.345	0.329	721.174	63.456	1.216	6.182
	$b_2$	372.793±68.547											
	$b_3$	53.389±4.074											
$\Delta E$ (compost extracts)	$b_0$	-0.042±0.009											
	$b_1$	0.009±0.001	0.196	0.187	1.013	19.743	<0.001	0.185	0.165	1.199	0.106	1.132	4.269
	$b_2$	0.399±0.112											
	$b_3$	0.048±0.007											





**Figure S1.** Analysis of the residuals for the: (a) MLR model describing moisture content, (b) MLR model describing total dissolved solids values, (c) PLR model describing moisture content, (d) PLR model describing ash content, (e) ANN model describing moisture content and (f) ANN model describing C/N ratio. (1) normal probability plot, (2) predicted value plots vs. residual plot, (3) histogram of residuals, (4) case vs residual plot.

**Table S2.** Coefficients and statistics of piecewise linear regression models for prediction of physicochemical properties of compost during the composting process based on initial moisture content, air flow and sampling day. Significant coefficients and standard errors (SE) are marked bold.

Output variable	Coefficient ± SE		Calibration				Prediction					
			R <sub>cal</sub> <sup>2</sup>	R <sub>cal</sub> <sup>2</sup> <sub>adj</sub>	RMSE	F-value	R <sub>pred</sub> <sup>2</sup>	R <sub>pred</sub> <sup>2</sup> <sub>adj</sub>	RMSEP	SEP	RPD	RER
Moisture content	Break point	61.801±7.126	0.837	0.835	2.501	508.638	0.834	0.831	2.144	0.189	2.526	9.433
	b <sub>0</sub>	19.059±4.159 32.022±6.161										
	b <sub>1</sub>	0.609±0.073 0.511±0.078										
	b <sub>2</sub>	1.867±0.139 0.571±0.148										
	b <sub>3</sub>	0.136±0.005 0.119±0.008										
Dry matter	Break point	38.198±6.851	0.837	0.835	2.501	508.638	0.835	0.831	2.131	0.189	2.543	9.493
	b <sub>0</sub>	67.979±8.375 80.940±7.492										
	b <sub>1</sub>	-0.511±0.021 -0.609±0.177										
	b <sub>2</sub>	-0.576±0.126 -1.867±0.241										
	b <sub>3</sub>	-0.121±0.002 -0.136±0.021										
Organic matter	Break point	70.203±9.513	0.675	0.672	3.322	205.003	0.652	0.650	3.503	0.308	1.776	7.951
	b <sub>0</sub>	85.588±11.537 83.851±4.382										
	b <sub>1</sub>	-0.319±0.015 -0.125±0.067										
	b <sub>2</sub>	-1.823±0.937 -1.124±0.099										
	b <sub>3</sub>	-0.157±0.014 -0.077±0.025										

Table S2. Continuing

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