

SUPPLEMENTARY MATERIAL

Study on the seed metering performance of potato seed metering device with three claw type on DEM

Linrong Shi, Erhao Chen, Yuhuan Sun

College of Mechanical and Electrical Engineering, Gansu Agricultural University,
Lanzhou, China

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Table S1. Experiment factors and levels of seed cleaning experiments

Level	The angle of seed clearing plate $X_4/^\circ$
-1	6
0	8
1	10

Table S2. Experiment scheme and results of seed cleaning experiments

$X_4/^\circ$	Qualification rate /%	Seed missing rate /%
-1	85.3	4.3
-1	84.7	4.1
-0.5	88.7	3.5
0.5	89.2	4.5
1	84.2	5.6
1	83.4	5.4
0	90.1	3.9

Table S3. Analysis of variance of seed cleaning experiments

Resource of variance	Qualification rate				Seed missing rate			
	Square	Freedom	F	p	Square	Freedom	F	p
Model	43.56	2	78.63	0.0006	3.64	2	64.81	0.001
X_4	1.03	1	3.71	0.1264	2.14	1	76.28	0.0009
X_4^2	42.53	1	153.56	0.0002	1.33	1	47.39	0.0023
Residuals	1.11	4			0.11	4		
Non-fitting term	0.61	2	0.30	0.6	0.072	2	1.8	0.94
Error	0.50	2			0.04	2		
Sum	44.67	6			3.57	6		

Table S4. Experiment factor and level of orthogonal experiments

Level	Factor		
	Speed of seed picking X_1 (m/s)	Seed picking claw Type X_2	The angle of seed clearing plate $X_3/^\circ$
-1	0.4	A	6
0	0.5	B	9
1	0.6	C	11

Table S5. Scheme and results of orthogonal experiments

Factor			Result	
X_1	X_2	X_3	Seed replaying rate	Seed missing rate
-1	-1	0	1.8	5.5
1	-1	0	2.5	4.0
-1	1	0	2.0	6.1
1	1	0	2.6	3.5
-1	0	-1	1.0	5.7
1	0	-1	2.3	4.5
-1	0	1	1.2	3.9
1	0	1	2.5	3.5
0	-1	-1	1.3	7.0
0	1	-1	3.0	3.5
0	-1	1	1.4	2.9
0	1	1	1.9	4.3
0	0	0	1.7	4.6
0	0	0	1.9	5.2
0	0	0	2.0	3.5
0	0	0	2.0	3.5
0	0	0	1.9	4.2

Table S6. Analysis of variance of of orthogonal experiments

Index	Source of variance	Square	Freedom	<i>F</i> value	<i>p</i>
Seed replaying rate Y_1	Model	3.57	9	2.87	0.0890
	X_1	1.9	1	13.76	0.0076
	X_2	0.78	1	5.65	0.0491
	X_3	0.045	1	0.33	0.05861
	X_1X_2	0.0025	1	0.018	0.8968
	X_1X_3	0.0088	1	0.0642	1.0000
	X_2X_3	0.36	1	2.6	0.0506
	X_1^2	0.032	1	0.23	0.0331
	X_2^2	0.24	1	1.72	0.02312
	X_3^2	0.24	1	1.72	0.2313
	Non-fitting term	0.91	3		0.0071
	Error	0.060	4	2.95	
	Sum	4.54	16		
	Model	16.33	9	4.09	0.00384
Seed missing rate Y_2	X_1	0.55	1	1.23	0.03018
	X_2	1.62	1	3.65	0.0976
	X_3	3.00	1	6.77	0.00354
	X_1X_2	3.06	1	6.90	0.0340
	X_1X_3	1.96	1	4.42	0.737
	X_2X_3	4.20	1	9.47	0.79
	X_1^2	1.23	1	2.77	0.1401
	X_2^2	0.56	1	1.26	0.2979
	X_3^2	0.11	1	0.26	0.6372
	Non-fitting term	2.12	3		
	Error	0.99	4	2.86	0.1683
	Sum	19.44	16		

Table S7. Simulation and experiment results comparison

Experiment index	Simulation experiment	Bench experiment
Seed replaying rate, %	2.5	3.7
Seed missing rate, %	1.6	2.9

