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

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Table S1. Experiment factors and levels of seed cleaning experiments

Level	The angle of seed clearing plate X_4/°
-1	6
0	8
1	10

Table S2. Experiment scheme and results of seed cleaning experiments

X_4/°	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/°
-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	F value	p
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		
Seed missing rate Y_2	Model	16.33	9	4.09	0.00384
	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