

/ / /

\*

// :

E-mail: [zakah@modares.ac.ir](mailto:zakah@modares.ac.ir):

\*

Archive of SID

( )

( )

( / / )

) ( )

(

---

---

## Improvement of Vacuum-Precision Planter by Development and Application of a Pneumatic Seed Knockout Device

H ZakiDizaji<sup>1\*</sup>, S Minaei<sup>1</sup> and MR Ousefzadeh Taheri<sup>2</sup>

<sup>1</sup>Department of Agricultural Eng, College of Agriculture, Tarbiat Modarres University, Tehran, Iran

<sup>2</sup>Research Center for Agriculture and Natural Resources of Eest Azarbijan, Tabriz, Iran

\*Corresponding author: E-mail: [zakah@modares.ac.ir](mailto:zakah@modares.ac.ir)

### Abstract

During the past few years, some investigations have been conducted at agricultural research centers and universities regarding the design or selection of suitable planters for sowing small seeds. Examination of different vacuum planters in Iran showed that the problem is the seed metering mechanism. Therefore, the main objective of the present research was the improvement of the existing vacuum-precision planters. A pneumatic seed knockout device was fabricated for these planters to improve them for sowing of the small seeds such as rapeseed. The new pneumatic seed knockout system was mounted for testing on the seed metering system of the vacuum-precision planter made by Behkesht (Agrifarm) company. The objective of this test was the determination of pneumatic seed knockout effect on planter performance. Independent variables were: rotational velocity of seed plate at three levels (40, 68 and 99 rpm) and air velocity of the pneumatic seed knockout device at three levels (0, 7-8 and 15-16 m/s). Dependent or measured variables included: three types of seed damages, cell filling percentage, and seed viability. Result of the analysis of variance indicated that metering plate velocity had a significant effect on percent cell filling. Increasing the rotational velocity, results in a significant decrease in percent cell filling. Air velocity had a significant effect on mechanical damage in the form of seed splitting and breakages as well as in the form of seed coat scratching and moving and on the sum of these values. All types of mechanical damage decreased, as air velocity increased. None of the independent variables had a significant effect on seed viability. The interaction of rotational velocity and air velocity was not significant. Test results indicated that not only the pneumatic seed knockout device decreased seed damage, but due to clearing the seed metering plate cells clogged by broken seeds and plant debris, it increased the cell filling percentage and improved overall performance of the seed metering systems.

**Keywords:** Design, Pneumatic seed knockout, Small seeds, Vacuum-precision planter

---

---

(

( :

( .

Archive of SID

(

(

(

(

)

( )

% /

)

% / %

---

<sup>1</sup>Air-Powered Seed Drill  
<sup>2</sup>Air Seeder

---

/ /

---

( ) LS900-4005

( )

( ) ( )

rpm, rpm)

( rpm

( m/s )

( :

)

( ( )

John Deere

SPSS 11.5 MINITAB 13

) hp

Solo

C90S-4

---

<sup>2</sup>Inverter  
<sup>3</sup>Okapi

---

<sup>1</sup>Nozzle

---

---

/ /

( )

( )

/

/

/

/

/

/



( ) ( :

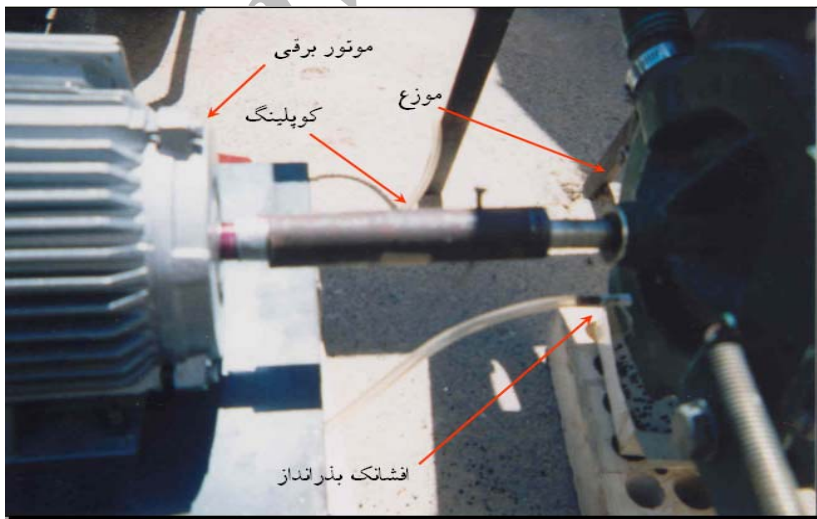
( :

( ,

/

( ) )

(



---

---

Archive of SID

---

---

/ /

---

---

\*

---

/ / /

/ / /

/ / /

/ / /

---

---

/ /

---

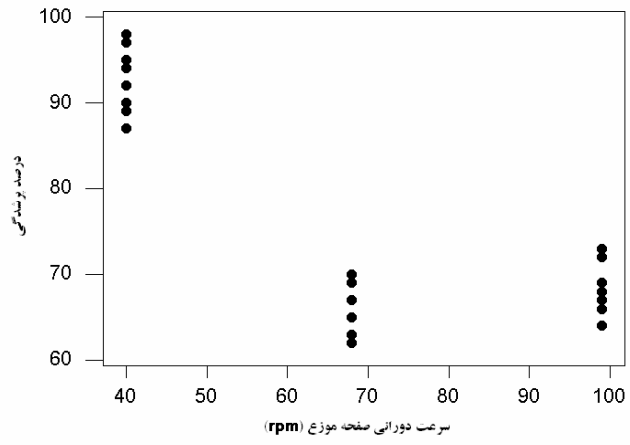
( $\alpha = /$  )

(m.s )		(rpm)			
/	/				
/ A	/ A	/ A	/ B	/ B	/ A
/ B	/ B	/ A	/ A	/ A	/ A
/ B	/ B	/ A	/ A	/ A	/ A
/ B	/ B	/ A	/ A	/ A	/ A
A	/ A	/ A	/ B	/ A	/ AB

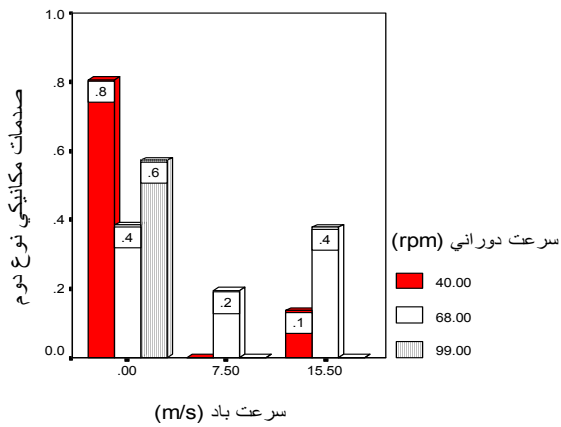
B A

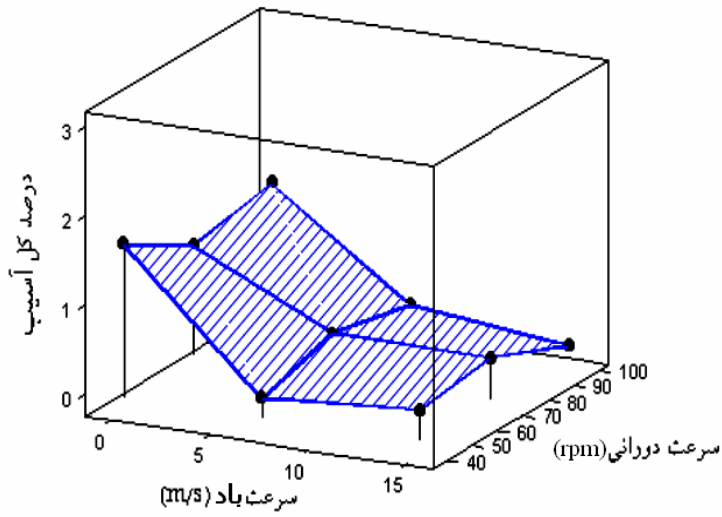
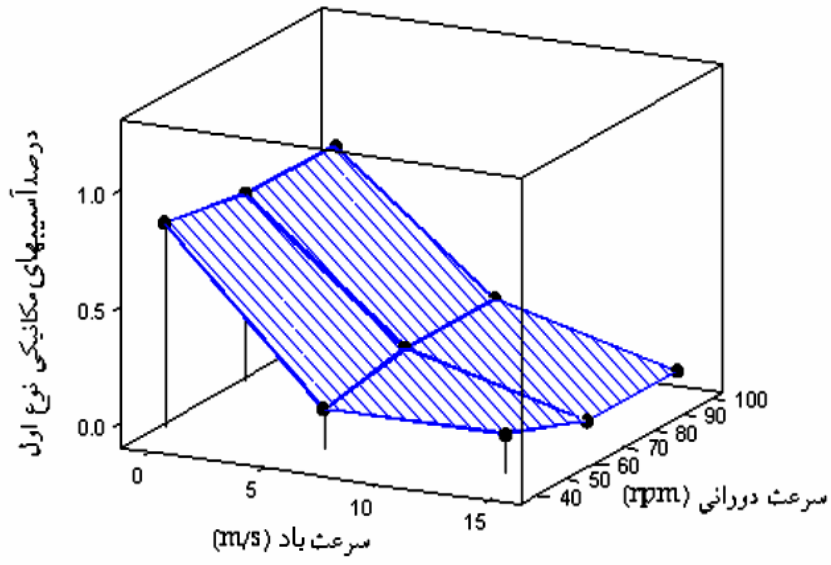
Archive of SID





P





---

---

Archive of SID

---

---

Frasier GW, 1985. A precision planter for seedling emergence evaluation. *Journal of Range Management* 82(2): 187-190.

Guarella P, Pellerano A and Pascuzzi S, 1996. Experimental and theoretical performance of a vacuum seed nozzle for vegetable seeds. *Journal of Agricultural Engineering Research* 64: 29-36.

Sial FS and Persson SPE, 1984. Vacuum nozzle design for seed metering. *Transactions of the ASAE*. 3(4): 688-696.

Zulin Z, Upadhyaya SK, Shafii S and Garrett RE, 1991. A hydropneumatic seeder for primed seed. *Transactions of the ASAE*. 34 (1): 21-26.