



Abstract of Research Reports

Agricultural Machinery and Mechanization Engineering

2020

No.	Title	Page
1	Technical, Quality and Economical Evaluation of Two Wheat Seed Process Lines	1
2	Effect of Pulsation Ratio and Vacuum Levels on Milking Machine Performance	2
3	Comparison of Bean Row Planting with Conventional (Flat Planting) Methods in Markazi Province	3
4	Investigation of Nano-Chrome Coating on The Impeller of Irrigation Pumps to Increase Resistance to Corrosion	4
5	Investigation of Uniformity of Total Mixed Ration in Feeder Mixer Equipment	5
6	Effect of Bent Leg Cultivator on Weed Control and Sugar Beet Yield	6
7	Determination of Wheat Losses in Straw Knocker Combines (Case Study in Kerman, Fars and Hamedan Provinces)	7
8	Design, Development and Lab. Evaluation of a Mechanized Harvesting Machine of Safflower Petals	9
9	Improvement of Air Deflector Blades in a Cabinet Dryer and Their Effects on Drying Rate of Melon Slices	10
10	Determining the Optimum Amount of Nitrogen Fertilizer Using Multispectral Remote Sensing	11
11	Design, Manufacture and Evaluation of Grain Loss Measuring System on Combine Harvesting	12
12	Investigation of Harvesting Machines, Method, and Potato Storage on Mechanical Damages, Rheological Properties and Storage Tuber Rot of Potato	13
13	Technical and Operational Evaluation of Mechanized Rapeseed Transplanting and Comparison with Direct Seeding Method in Khuzestan	15
14	Construction and Evaluation of Cereal Combine Head Attachment for Harvesting of Sunflower	16

Technical, Quality and Economical Evaluation of Two Wheat Seed Process Lines

H.R. Gazor*, A. Hamidi, A. Eyvani and H. Asadi
E-mail: hgazor@yahoo.com

Abstract

Wheat seed processing compared in two Iranian plant (Ram Sanat Bahare) and imported plant (Akyurek Technology) from turkey. Performance of each plant evaluated for two Iranian varieties of wheat as: Pishgam and Sardari. Technical information and seed quality parameters such as percentage of normal and abnormal plant were study. Also, critical points of wheat seed process were determined for each line. Besides, seed lost in waste out let of each machine and energy consumption for wheat seed processing was study. Moreover economic analysis was performed using partial budgeting method. Profitability indexes and economic value of seed lost were determined for each plant. Results of research showed that, about 87 percent of initial seeds finalized to qualified seeds averagely in each of two lines. Cleaning efficiency, separation efficiency and process efficiency for wheat seed were 94.3, 59.5 and 75.9 respectively in Akyurek plant. Also, in Ram Sanat Bahare plant cleaning efficiency, separation efficiency and process efficiency were 94.6, 58 and 73.6 respectively. Physical purity and germination of seeds increased 12 and 4 percent in Akyurek plant using of cleaning. Also, Physical purity and germination of seeds increased 9.9 and 6.6 percent in Ram Sanat Bahare plant too. Broken seeds in each line were less than 0.4 percent. Specific energy consumption for wheat seed processing was 39.6 and 53.7 MJ/tonne in Akyurek Ram Sanat Bahare plants respectively. Lost seeds in impurities separated of seed in Akyurek and Ram Sanat Bahare plants were 14.6 and 22 percent respectively. Suitable adjustment and some technical correction reduce seed lost in process. Critical points in seed processing for two lines were the sand outlet in gravity table and oat outlet in indented cylinder. These two outlets have More than 90 percent of qualified seeds in their selves. Using of destoner and special long separator prevent of seed lost in wheat seed process line. Besides, using additional sieves in seed air screen cleaning machine improve capacity, seed cleaning and eliminate seed lost in machine. Non-significant difference observed at level 5% for normal and abnormal plant in initial and processed seeds in two lines. In order to improve quality process in Iranian plants, it recommend to use technical signs and warning labels such as sieves arrangement and size, safety label in seed process line machines. Besides, technical training course for costumer is recommendable. Economic results show that Benefit-Cost Ratio changes in 1.05 to 1.12 range during ten year. That is, one Rial investment in this activity had 1.1 rial benefit. Thus, continue of this activities are economic.

Keywords: Wheat Seed, Cleaning, Seed Processing

Effect of Pulsation Ratio and Vacuum Levels on Milking Machine Performance

M. A. Behaeen* and A. Karimi
E-mail: ali_behaeen@yahoo.com

Abstract

Investigating the effective variables in a milking machine can be effective on increasing the efficiency of this machine (reduce milking time, no milk stipping and hand milking) as well as reducing mastitis disease. To achieve these goals, the effect of variables of pulsation ratio at two levels of 65:35 (R1) and 70:30 (R2), and vacuum at two levels of 38 kPa (P1) and 40 kPa (P2) in a factorial experiment with randomized complete block design (RCBD) and five replications was investigated. The parameters included the performance parameters of the milking machine based on the measurements the time it takes for the milk to flow into the sub-tanks, the maximum amount of milk obtained after 20 seconds of milking (peak milk flow) material capacity of milking machine, the amount of milking clusters coming down from a cow's breast, measurement of teat diameter before and after milking and determine the compressibility of the breast teat were measured and calculated. Data were analyzed using SAS software and comparing the means performed by Duncan's multiple range test. The results showed that pulsation ratio is a more effective variable than the vacuum level. Milk flow rate and breast teat sphincter opening are also available in lower vacuum and pulsating ratios; So at a vacuum level of 38 kPa and a pulsation ratio of 65:35 (treatment P1R1), amount of milk at the start of milking and 20 seconds after milking did not show significant differences at 5% level with other treatments. This treatment (P1R1) was also suitable in terms of material capacity of milking machine. Given the association between mastitis disease with increased vacuum and pulsation ratio, treatment P1R1 is recommended to increase the efficiency of the milking machine.

Keywords: Milking Machine, Material Capacity, Pulsation Ratio, Vacuum Level

AERI

Comparison of Bean Row Planting with Conventional (Flat Planting) methods in Markazi Province

A. Hedayatypour*, R. Pourmatin, H. Beheshtinedgad, M. Tahmasebi, M.R. Abkhiz, M. Mahmoodi and A. Mohtat
E-mail: ahedayatypoor@yahoo.com

Abstract

In order to study of the effect of Flat and Row planting methods on Bean yield, two experiment was carried out with three treatments at two farms in Arak and Shazand that located in markazi province. Treatments were 1-Flat planting with seed density of 170-180 Kg/ha, 2-Single row on a ridge with 50-60 Kg/ha and 3- Double rows on a ridge with seed density of 80-90 Kg/ha. In Shazand farm, the type of irrigation was furrow irrigation. Due to high slope, and uneven irrigation, The Final Percentage of Seedling Emergence was very low and weeds intensity increased. Therefore the experiment was ended. The method of irrigation at the second farm (Arak city) was Micro irrigation method. Geiran Bazr Arya was used as grain driller. The space between ridges was 75 and 18 Cm respectively in Row and flat planting methods. Calibration operation was carried for each treatment. Emergence of seedlings rate, Effective field capacity of grain driller for each planting method, Yield and Yield components were measured. Dada of experiment were analyzed by SPSS software. Mean comparisons were done by using t test ($p < 0.05$). Although cultural management in each treatment was the same, however there was a problem in single row on a ridge. The number of pods was very limited on each shrub. So that no grain yield was obtained. The results showed, the yield of bean in Flat and double row on a bed pattern was 1441 and 1713 Kg/ha respectively. Observed differences was not significant ($p < 0.05$). The amount of production cost reduction in double rows on a ridge was 83000000R. Double rows on a ridges is recommended because of possibility of mechanical weeding and hilling-up operations. Fat planting does not recommended because of high seed density and impossibility of mechanical weeding.

Key words: Bean, Planting Method, planting on a Ridge

AERI

Investigation of Nano-Chrome Coating on the Impeller of Irrigation Pumps to Increase Resistance to Corrosion

H. Sharifnasab*, M. Akbari, N. Mohebati, H. Seraje and Z. Ghaffari Asl
E-mail: hsharifnasab@yahoo.com

Abstract

One of the major problems in various industries today is the issue of metal corrosion. The corrosion phenomenon of metals in various industries is costly to repair or replace damaged metal parts, which can also be a waste of time. One of the common ways to reduce such damage is to use nano-coatings. In this study, nano-chromium nitride (CrN) coating with physical vapor deposition method (PVD) with approximate thickness of 2 microns were used to reduce the corrosion rate of centrifugal pumps with a thickness of 2 microns. One layer and the other were applied to the nitrogen plasma substrate and then analyzed by SEM imaging, hardness test, and XRD. The results showed that the difference between the life of conventional impeller and coated impeller was significant at 99% confidence level. Without the substrate, it was significant at 99% confidence level. Overall, the corrosion resistance of the pump impeller improved after applying the coating to the conventional impeller without these coatings by 55% in the substrate-free sample and 76% in the substrate-impeller. Accordingly, it recommended polishing the impeller for coating on cast iron butterflies, then covering with nitrogen substrate and finally applying CrN coating on PVD process.

Key Words: Nano-coating, Corrosion, water pumps

AERI

Investigation of Uniformity of Total Mixed Ration in Feeder Mixer Equipment

M. A. Behaeen*, A. Karimi, S. Karimi, A. Jokar and M. Zare
E-mail: ali_behaeen@yahoo.com

Abstract

Total Mixed ration are used to increase production in the livestock and poultry industry. Total Mixed ration differs in physical properties of ingredients. Important point in preparing this type of livestock feed, is uniformity of mixing of materials and the same distribution at each livestock. In order to investigate the uniformity of the mixed ration in a feeder mixer equipment, effect of three levels of spiral axis 50 (R50), 60 (R60) and 70 (R70) rpm, feed mixing time at three levels of 15 (T15), 18 (T18) and 21 (T21) min was analyzed with a factorial experiment in completely randomized design and three replications. The parameters included measuring the crushing of mixed ration, measurement and calculation of the uniformity of the mixed materials and the flow ability of the mixed materials (Fraud number). Data were analyzed using SAS software and comparing the means performed by Duncan's multiple range test. The results showed that the highest amount of mixed material crushing (the lowest in geometric mean of material) was obtained at spiral revolution of 70 rpm and 21 min (treatment R70T21). The lowest forage crushing was obtained at spiral revolution of 50 rpm and 15 min (treatment R50T15) and significant difference with each other. The highest uniformity was obtained in treatment R70T21. Due to the great use of feeder mixer equipment in dairy farms and saving time on preparing a total mixed ration, total mixed ration should be provided in low revolution of the spiral axis and adequate time. With the reviews, R50T18 with standard deviation of 1.39 cm in crushing of mixed ration (Sgm) and the uniformity of the mixed ration with 1.63 g (Sd) is recommended.

Keywords: Feeder Mixer Equipment, Total Mixed Ration, Uniformity

AERI

Effect of Bent Leg Cultivator on Weed Control and Sugar Beet Yield

A. Solhjou*, M. Bazrafshan, F. Ghezeli, E. Zareh and E. Baharloo
E-mail: amsolhjou@yahoo.com

Abstract

Mechanical weed control in field can reduce the environmental issues due to using the high amount of herbicides and the cost of them. Cultivator geometry can affect weed seeds translocation and weed control. This study was a complete experimental design with seven treatments and three replications in silty clay loam soil of Zarghan of Fars province for one year to determine the effect of the new bent leg cultivator on reducing weeds and sugar beet yield. Treatments were 1) bent leg cultivator with 45 mm width, 2) bent leg cultivator with 45 mm width + furrower, 3) bent leg cultivator with 65 mm width, 4) bent leg cultivator with 65 mm width + furrower, 5) conventional cultivator (crescent blade), 6) control of weed in all seasons (control) and 7) without weed control (control). In this project, the effect of cultivators on weed control percent, percent of earthing up plant, root sugarbeet yield, sugar content and gross sugar yield in sugar beet field was studied. Results indicated that cultivator geometry affected weed control and crop yield. The bent leg cultivator with 65 mm width + furrower compare to conventional cultivator increased weed control by 16.97%, percent of earthing up plant by 50.6%, root yield by 5.5%, sugar content by 0.56% and gross sugar yield by 6.1%. Results also indicated that proper treatments was bent leg cultivator with 65 mm width + furrower. The findings show potential for new bent leg cultivator technology to increase weed control and crop yield, therefore, improving work-rate and reducing use of herbicides.

Key words: Bent Leg, Cultivator, Economical, Sugar Beet, Weed

AERI

Determination of Wheat Losses in Straw Knocker Combines (Case Study in Kerman, Fars and Hameden Provinces)

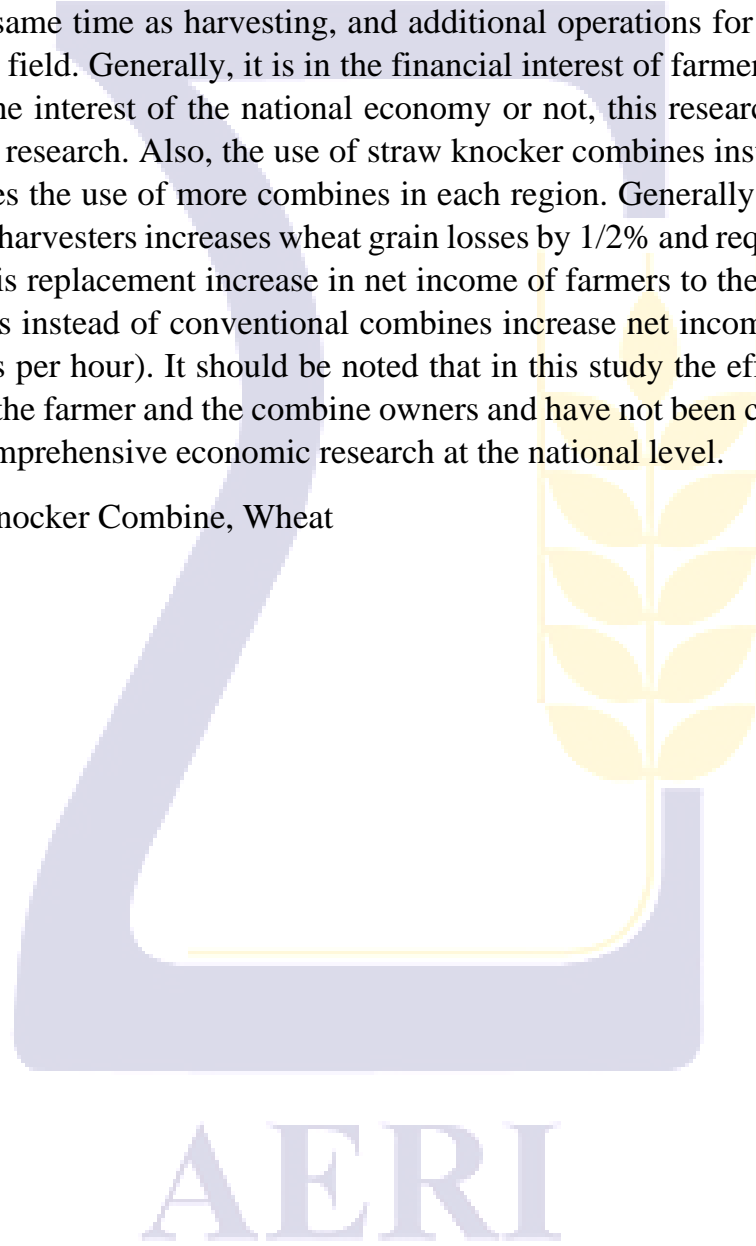
M. A. Rostami*, M. Shaker, M. R. Bakhtiari, L. Shafiei, M. Behzadi, M. Shabaniyan, F. Ahangari, H. Lahsaei, H. afzaligorouh,
H. Najafinejad and A. Mansourialam
E-mail: marostami1351@gmail.com

Abstract

For now, due to various reasons such as drought and reduced fodder production in the country, the remnants of harvesting different products such as wheat and barley have been of great importance to farmers. As a result, new combines have been marketed under the name of the straw knocker combine, which grind the wheat straw and store it in a reservoir. In the present study, quantitative and qualitative losses of wheat grain in the harvesting crop were evaluated and the economic evaluation of wheat harvest with the combine from the perspective of farmers and social workers was done using a partial budgeting method. The studied parameters included head loss, threshing loss, total loss, and grain breakage and germination percentage. Sampling was done randomly in fields of Kerman, Hamedan and Fars provinces. The results of this study were compared with the results of grain loss analysis in conventional combines implemented in another national plan in the country. The results showed that the natural loss of wheat in the three studied provinces was 0.75% and the total amount of combine losses (sum of platform and end losses) in straw knocker and conventional combines was 4.91% and 2.84%, respectively. The average grain losses in the platform of conventional and combine harvesters were 2.45% and 1.8%, respectively. Grain losses per crushing unit of conventional and combine harvesters were 2.46% and 1.04%, respectively. In conventional combines, the whole grain losses falls on the ground and wasted, while in straw knocker combine harvesters, only 2.45% of total losses (4.91%) that are lost in the cutting platform falls on the ground and wasted and crushing losses (2.46%) were collected in straw tank and fed to the animals with straw. Damage to seeds in conventional combine harvester was less than that of straw knocker combine harvester and seed germination percentage in straw knocker and conventional combine harvester was 91% and 95%, respectively. In straw knocker harvesters, due to the severe blows to the crushing unit, about 12.5% of the seeds have fracture or invisible damage and are unable to germinate, so they are not suitable for harvesting seed crops. In conventional combines, debris from the end of the combine is dumped onto the ground and collected and removed from the field to drive other machines and at the expense of surplus. In the straw knocker combine harvesters, these residues are

collected in the straw tank at the same time as harvesting, and additional operations for packaging, crushing and removing wheat straw are removed from the field. Generally, it is in the financial interest of farmers to use straw harvesters, but at the national level whether this is in the interest of the national economy or not, this research cannot answer this question and requires comprehensive economic research. Also, the use of straw knocker combines instead of conventional combines, due to the lower field capacity, requires the use of more combines in each region. Generally, although the use of straw knocker harvesters instead of conventional harvesters increases wheat grain losses by 1/2% and requires more harvesters in the country due to lower farm capacity, but this replacement increase in net income of farmers to the 954335 Tomans per hectare. Also, the use of straw knocker combines instead of conventional combines increase net income of combine owners to the 70879 tomans per hectare (35439 tomans per hour). It should be noted that in this study the effects of this replacement have been examined from the perspective of the farmer and the combine owners and have not been considered from the national interest perspective and require further comprehensive economic research at the national level.

Keywords: Grain losses, Straw Knocker Combine, Wheat



Design, Development and Lab. Evaluation of a Mechanized Harvesting Machine of Safflower Petals

H. Sharifnasab*, M. Safari, A. Eyvani, N. Raisijafarabadi, E. Emami and A.H Omid
E-mail: hsharifnasab@yahoo.com

Abstract

Safflower *Carthamus tinctorius* L. is an herb suitable for dry and semi-arid areas, cultivated for the production of seeds and petals. In this research, a machine for harvesting Safflower petals was made which includes a cutting blade, a suction motor, an abrasive tube, a holder box Engine and bag, electric motor and chassis for moving from plants. In order to evaluate the picking machine of safflower petal plant with manual harvesting in the farm of Karaj, Seed and Plant Improvement Research Institute, a completely randomized block design with three replications the cultivars of Goldish were selected. The selected treatments included air suction (level 1) (low) at 19 m / s and 3500 RPM, air suction (surface 2) at speeds of 25 m / s and 4000 RPM (medium) and air suction (level 3) at 36 m / s and 4800 RPM (high) speed and manual handling by the worker (control). It was concluded that harvesting time was significantly different at three levels of suction at 1% level, and the lowest time was related to suction and the maximum time for manual harvesting. Among other cases, petal fall was observed at harvest and at 1% as mentioned above, the use of the device in the first suction improved the rate of loss to 79.1%, the second suction was 93.09% and the third suction was 94.93% than the manual picking. This machine can collect between 3 kg and 4 kg of safflower petals for 8 hours a day. The amount of petal fall during harvest is greater than harvesting by car. According to the economic evaluation, this device is economically viable.

Keywords: Design and Construction, Evaluation Petal Picking Machine, Safflower Plant

AERI

Improvement of Air Deflector Blades in a Cabinet Dryer and Their Effects on Drying Rate of Melon Slices

O. R. Rostapour*, M. A. Behain, H. R. Gazor, M. Zare and F. Kazemi
E-mail: roustapour@gmail.com

Abstract

In this research, air deflector plates were used in order to increase the air elapsed time in the chamber. The air flow pattern was simulated using CFD. The geometry of the chamber was produced in 2D and meshed by triangular and quadrilateral elements, boundary conditions were defined and the governing equations solved. Modeling of flow without any deflectors depicted the air flowed to the chamber conducted to the outlet without any distortion. Air vortices were generated when the deflectors defined in model. To evaluate the influence of deflectors on drying period, constructed plates installed in the dryer chamber and melon slices were dried when deflectors used or not. Simulation results showed magnitude of the air velocity was increased and temperature uniform distribution developed on the surface of trays. Drying time and energy consumption reduced up to 22% and 27%, respectively when the deflectors were employed.

Keywords: Air deflector plates, Cabinet dryer, Computational fluid dynamics (CFD), Drying period, Energy consumption, Melon

AERI

Determining the Optimum Amount of Nitrogen Fertilizer Using Multispectral Remote Sensing

N. Bagheri* and M. Jaberi Aghdam
E-mail: n.bagheri@areeo.ac.ir

Abstract

Nitrogen is one of the most important and widely used inputs in crop production and its application has a significant impact on product yield and quality. The conventional method of applying nitrogen fertilizer is uniform spraying of fertilizer at the farm level, which usually results in improper spraying. Conventional nitrogen determination methods are often destructive, costly and time consuming. Due to the negative effects of inadequate use of nitrogen fertilizers and the limitations of available methods, the application of non-destructive, rapid and accurate techniques and techniques to determine the optimum amount of nitrogen fertilizer is necessary. Remote sensing is one of the new technologies that can be used to determine plant nitrogen and fertilizer recommendation. Therefore, in this research, the capability of multispectral aerial imagery taken by UAVs for determination of the optimum amount of nitrogen fertilizer for corn was evaluated. The research was conducted on a farm in Varamin city in a randomized complete block design with 4 treatments and 4 replications. Urea fertilizer was distributed in two stages with irrigation water. Data were analyzed after aerial multispectral imaging with a UAV and ground sampling. Leaf chlorophyll and nitrogen content were measured for each sample. Based on the results of validation of vegetation indices-based models, the REIP index with R² of 0.98 was the best index for estimating plant nitrogen in V8 stage and the TCARI index with R² of 0.97 was the best vegetation index to estimate plant nitrogen in VT growth stage. Also, nitrogen fertilizer was administered for the next stage of fertilization using the obtained models. Based on the results, aerial remote sensing technology is an appropriate and accurate method for estimating the chlorophyll and nitrogen content of corn and fertilizer administration.

Keywords: Nitrogen Fertilizer, Precision Agriculture, Remote Sensing, Spectral Imaging, Unmanned Aerial Vehicle (UAV)

AERI

Design, Manufacture and Evaluation of Grain Loss Measuring System on Combine Harvesting

S. Nazarzade Oghaz*, A. Nazarzade, M. H. Saeedirad, S. Zarifneshat, M. Naseri and Saeed Sajjadi
E-mail: sanazarzadeh@yahoo.com

Abstract

The limitations of water resources and, ultimately, food and nutrition necessitate a proper functioning of the resources and productivity. On the one hand, the proper design of agro-breeding operations and, on the other hand, the use of precision equipment and appropriate equipment can provide a good basis for the sustainable production of agricultural products and food. One of the most important agricultural operations is the harvesting of wheat. I believe that the main crop is the country, and it is very necessary and inevitable to consider harvesting and reducing losses during harvesting. The harvest loss in a combine depends on the combine settings, the input material rate, the condition of the product and the ground. In order to investigate the amount of grain pulp, the seed loss measurement system that can be installed on the combine is used. In order to ensure that the combine has a "grain size measurement" system, it has to stop the harvesting several times so that the mortality and grain loss and the origin of the seed Definition of casualties. "Grain Crop Measurement System" Combine is a tool that can be used to determine the amount of mortality caused by combustion separators and combines. In this project, different methods of measuring the drop in grain were investigated and, finally, a suitable method of selection, then design, construction and evaluation were carried out. The project involved the preparation of suitable piezoelectric sensors, the necessary tests were carried out on wheat grain and mixed grains and straw, and finally the wheat grain measurement system was designed and constructed. The results showed that wheat grain measurement system consisting of piezoelectric sensors and electronic circuit with PLC could be good for detecting the amount of grain thinning in the output of straw and percentage of loss.

Keywords: Combine, Loss, Measuring, Sensor, System, Voltage, Wheat

AERI

Investigation of Harvesting Machines, Method, and Potato Storage on Mechanical Damages, Rheological Properties and Storage Tuber Rot of Potato

M. R. Bakhtiari*, F. Goudarzi, A. Arjmandian and A. Bagheri, H. Soltani, M. R. Mostofi Sarkari, B. Mehranfroz, A. Rastar, S. M. Samadpour, M. Shabaniyan and H. Saedi
E-mail: ym_bakhtiyari@yahoo.com

Abstract

Every year, potatoes are cultivated in more than 25,000 hectares of agricultural lands in Hamadan province. Harvesting machines are used to harvest potato tubers, which cause mechanical damage due to the presence of metal parts. Also, potato tubers are sensitive to mechanical damage and increased damage caused by pathogenic microorganisms during storage. Therefore, in this study, the effect of two types of harvesting machines and five harvesting methods on the amount of mechanical damage and storage diseases and changes in rheological properties of two Agria and Jilli potato cultivars were studied in a three-month storage period in both technical and non-technical warehouses using a factorial experiment in a randomized complete block design (RCBD) with three replications. The harvesting machines examined included Grimme and Sabzdasht. Harvesting methods include 1. Topping and immediately picking up, 2. Topping and harvesting after 12 days, 3. Topping and harvesting after 12 days in the cattle soil, 4. No topping and natural harvesting, 5. No topping and natural harvesting in the cattle soil. Investigations of mechanical damages of potato tubers at harvest time include damaged topsoil tubers and damaged subsoil tubers and during storage include determination of rheological properties, reduced sugar content and percentage and severity of caries diseases of Fusarium dry rot and bacterial soft rot, were performed before and after the end of storage period. The results showed that the most suitable method of harvesting potato tubers is 12 days after topping. During this time, the skin of tubers becomes thicker and more resistant to mechanical damages. Harvesting after the natural growth period is also considered as an option by farmers, but only if the land is tilled at the time of harvest. The results also showed that with increasing storage life of tubers, the tubers' strength and brittleness decreased and their susceptibility to wear and mechanical damage decreased. These changes are manifested in the form of an increase in compressive strength and the stress relaxation percentage of tubers. Unlike the Agria cultivar, the difference between harvesting machines was not significant in terms of the rheological characteristics of Jilli cultivars. Compressive strength of Agria and Jilli tubers at the

end of the storage period compared to harvest time increased by 24 and 32%, respectively. The highest resistance of Agria and Jilli tubers against probe penetration of the tissue meter was calculated to be 6.27 and 6.47 Newton, respectively. The increase in the percentage of stress relaxation of tubers of Agria and Jilli at the end of storage period than the harvesting time was 4% and 2.5%, respectively. The product harvested by Grimme harvesting machine and harvesting method of S12M (topping and harvesting after 12 days in the cattle soil) with storage in the technical warehouse showed the best results in maintaining the characteristics of the tubers during storage period. Agria cultivar was also more sensitive to mechanical damage and stress during harvesting than the Jilli. In this study, Jilli introduced itself as a cultivar with good resistance to abrasion and mechanical damage during the harvest period. Also in this study 5 species of *Fusarium* fungi cause dry rot, including *Fusarium equiseti*, *F. oxysporum*, *F. solani*, *F. culmorum*, *F. sulphuerum*, and a bacterial species of soft-rot decay agent *Pectobacterium carotovorum* from decaying tubers were identified during the storage period of the potato. The results of comparison of harvesting machines showed that weight loss of tubers harvested by Grimme harvesting machine was 2.92% less than Sabzdasht harvesting machine after storage. Agria cultivar is also more sensitive than Jilli cultivar to mechanical and fungal and bacterial lesions, so that the weight loss in Agria cultivar was 15.67% and in Jilli cultivar it was 12.88%. Based on this, the crop harvested by the Grimme harvesting machine and the method of crop topping and harvesting after 12 days later in the cattle soil, showed the best results in maintaining the characteristics of the tuber during the storage period. Agria cultivar was also more sensitive to mechanical damage and mechanical stress during harvesting, and it is best to use a Grimme machine to harvest this cultivar. The Jilli cultivar introduced itself as a cultivar with good resistance to abrasion and mechanical damage during harvesting.

Key words: Harvesting Machine, Harvesting Method, Potato, Topping, Storage



AERI

Technical and Operational Evaluation of Mechanized Rapeseed Transplanting and Comparison with Direct Seeding Method in Khuzestan

J. Habib Asl*, A. Azizi, L. Behbahani and H. Sabet Zanganeh
E-mail: jhabibi139@yahoo.com

Abstract

To evaluate canola transplanting possibility in Khuzestan province and comparing it with seeding method, current study was conducted during two cropping season of 2017-18 and 2018-19. The first and second years of the study were done in Shavoor Agriculture Research Station and Shahid Rajaiee Agro Industry of Dezful respectively. Transplanting (TR) of 38-day seedlings was applied by a 4-rows vegetable transplanter, which planted about 9 seedlings per m². In seeding (SD) method, 6 kg/ha of canola was planted as two rows on each raised bed at a distance of 60 cm. other operations including irrigation, fertilization (based on soil test), nutrition, pest and disease control and harvesting were same in both treatments. The measured and evaluated parameters were rapeseed yield and yield components, extracted oil, and economic assessment of the planting methods. The result showed that in case of rapeseed yield, thousand seeds weight, number of side stems, plant height, and extracted oil, there was no significant difference between canola transplanting and seeding methods. Two-year average grain yield in TR and SD were 2198.4 and 2361.5 kg/ha respectively. So, it can be concluded that Khuzestan province has the potential for canola TR, without any grain yield reduction as compared to SD method. The results also showed that there was significant difference (at 1% level of significance) between the treatments in terms of number of capsules per each side stem. More plant spacing cause to greater vegetative growth and then 64% more capsules per stem produced in TR as compared to SD. Also, the diameter of main and side stems in TR method with 19 and 7.18 mm were 31 and 16.5 percent more than that of DS method respectively. Water use efficiency in TR and DS were calculated as 0.37 and 0.43 kg/m³ respectively. Benefit to cost ratio for one hectare of rapeseed production in TR and DS were 0.96 and 2.98 respectively. Despite saving considerable amount of water, land use and chemicals in TR, the income was less than the cost. Therefore, due to high cost of production and planting of seedlings, TR method is not economical in the current situation.

Key Words: Canola, Grain Yield, Mechanized Transplanter, Transplanting, Seeding Method

Construction and Evaluation of Cereal Combine Head Attachment for Harvesting of Sunflower

M. Safari*, H. Tavakoli , A. Ayavani and A. Younesi
E-mail: email2safari@yahoo.com

Abstract:

In Iran, more than 50,000 hectares of sunflower (oil and nuts type) are cultivated annually. Due to the incompatibility of conventional grain combines available with sunflower characteristics, large amounts of grain are lost by these combines. Therefore, it is currently being harvested manually. Manual harvesting has increased labor hardships, energy consumption and production costs. In this research, in order to harvest this product, modifications were made to the conventional heads of the combine harvester (John deer 1055) to allow simultaneous harvesting, beating and cleaning of sunflower. After designing and fabricating the accessory, the improved head in field conditions was evaluated and compared with conventional harvesting methods. The main unit of attachment system were pans, lier bar and feeder drum. The field evaluation of the improved head was based on a randomized complete block design with three replications. Treatments included: 1) Harvesting by a modified combine head, 2) Harvesting by combine with pans attachment, and 3) Harvesting by hand. In each of the machine treatments, beating and cleaning units were set up for sunflower harvest. The results showed that there was a significant difference between the treatments in terms of combine losses, field capacity and harvesting costs at 5% level. In modified combine, combine with pans attachment and manual method, combine losses were 0.72, 4.85 and 6%, field capacity 1.2, 1.13 and 0.12 ha.h⁻¹, respectively. The profit-to-cost ratio was 13.97, 13.3 and 3.01, respectively. The breakage percentage was 3, 3.3 and 0.56. According to the results, due to the low loss, appropriate field capacity and low harvesting costs, the use of John deer 1055 combine with modified head is recommended for harvesting sunflower.

Keywords: Combine Head, Harvest, Improvement, Sunflower

AERI



Agricultural Engineering Research Institute (AERI)

Postal Address: P. O. Box 31585-845, Karaj, Iran