The investigate of harvest date on grain losses in rapeseed genotypes

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Abstract

In order to select optimum harvest time for avoid grain losses in cold temperate regions, an experimental design in factorial with randomized completely block were conducted. Experiment treatments were consist of four Genotypes multiple three sowing dates. Genotypes including Colvert, Okapi, Orient and Cobra. So sowing date s were 10, 20 Sep and 2 Oct. The character that measured was grain yield and grain losses in farm in harvest times (physiological ripening about 30-45 percent brown like pods, 10, 20 and 30 days after physiological ripening). The results showed that were significant difference (p < % 1) among Genotype for grain yield. There were significant difference (p < % 1) between sowing dates, that In all of times, 1 th sowing date and were the most and 3 th sowing date were the least in grain yield. Interaction between variety and sowing date on grain yield in 10 days after physiological ripening had significant difference (p < % 1). Cobra variety had about 3234.25 kg/ha in 10 Sep, Orient (2982 kg/ha) and Colvert (2948 kg/ha) Genotype were at the second categorize. Orient variety with 1732.25 kg/ha in 2 Oct. had the least grain yield (p < % 1). Grain losses of variety at 20 and 30 days after physiological ripening was significant difference (p < % 1) and Cobra variety were the most and Okapi variety was the least in loss. Interaction between variety and sowing date on grain losses in 10 days after physiological ripening had significant difference (p < % 1). Therefore, Okapi variety at the 1 th and 2 th sowing date were upper and Colvert variety in 2 th sowing date were inverse. Overall, results showed Genotypes sensitivity to grain losses was different in field and sowing date partially affects grain losses.

Key words: colza Genotypes- sowing date- grain yield – harvest time

Introduction:

North of Iran country such as Mazamdaran and Golestan has desirable condition for canola cultivation.

In Iran, people's annual demand to edible vegetable oil is about 1 million tons, but the average national vegetable oil production is low. So the rest amount of it has to be imported from other counties. And now, increasing rapeseed oil supply is an important way to solve this problem in that the planting area of peanut, sesame and flax could not increase on a large scale. Iranian farmers have great enthusiasm to grow rapeseed, especially double-low hybrid rapeseed which has high economic value. The reasons are as follows: money investment is relatively low to grow rapeseed; growth season is different from that of field crops; rapeseed could increase the yield of next field crop. Rapeseed is both oil crop and cash crop in most parts of Iran; in addition, rapeseed cake is a kind of good feed to raise domestic animals. So rapeseed is an important source of farmer's income in Iran. The governments at all levels afford more and more funds to develop rapeseed production to accelerate the increase of framer's income and local economy. Breeding and extension work of high-quality hybrid rapeseed is a main momentum that accelerates Iran's rapeseed development all the same in resent year. Up to now, Iranian rapeseed breeders had worked out some middle and late maturity hybrid Genotype which is suitable in the region of Iran. But the early maturity rapeseed Genotype which can be applied in the places of three crops a year has not come out. In addition, Iran needs some B. Campestris and B.juncea rapeseed Genotype to grow in northern and some high-altitude regions. So Iran plans to put more energy and money to the high-quality hybrid rapeseed Genotype breeding work in the future. At the same time, every rapeseed Genotype should be sowed in the best suitable places according to the natural conditions. The differences between Double-low hybrid rapeseed and ordinary routine rapeseed are various such as in the aspects of anti-bad circumstances and fertilizer absorption trait etc. So in order to make rapeseed yield rise, high-yield cultivation technologies should be combined with high-quality rapeseed Genotype. It is necessary to make the yield increasing potential of high-quality rapeseed Genotypes sure. A perfect management system should be set up in rape seed production and purity control. In the meanwhile, a smooth seed supply channel should be opened sooner. In order to increase the potential value of high-quality hybrid rapeseed, the high-quality commodity rape seeds should be divided from ordinary rape seeds in the course of purchasing, processing and utilization. The farmers who plant double-low rapeseed will get more money than planting ordinary one. So in this way, it is possible to accelerate the high-quality rapeseed production development in Iran. Cultivar, seeding rate, and time of weed removal may become important tools in managing canola in Iran. The new hybrid canola Genotypes are higher yielding and in this case earlier maturing than the conventional canola variety. Harvesting time may play a role in maturity of canola as well as a method of weed management. Further research is needed to determine if these effects are consistent under other growing conditions, and to determine the influence late emerging weeds have on ease of harvest and weed seed banks. Given more favorable early spring moisture conditions, we would anticipate a positive canola response to agronomic techniques. Different problems such as uneconomical current sowing date and gradual erosion in these systems and on the other hand reduction of consume water and fertilizer rates in canola, cultivation of canola can apply in rotation for increasing organic matter of soil.

The canola crop is harvested in summer, under warm, dry conditions which produces seed of low moisture with good storage characteristics. These conditions also favor high quality seed low in chlorophyll and free fatty acids. The majority of the Iranian crop is swathed to avoid seed losses through pod shatter. Swathing is commenced when 40-60% of seed in pods in the middle of the crop canopy have turned black or brown. This indicates seed moisture of 30-40% and physiological maturity. Pick-up and threshing of the windrow commences when the seed moisture has fallen to less than 8.5%, about 7 to 10 days after swathing the main factors affecting the quality of canola in storage include seed maturity and condition, seed moisture, temperature, length of storage. The original condition of the seed is probably the most important factor affecting its storage. Freshly harvested canola can maintain a high respiration rate for up to six weeks before becoming dormant. This process is often referred to as “sweating” and is a very unstable condition for binned canola. Monitor regularly because rapidly respiring seed produces heat and moisture favouring the growth of storage moulds. Mould growth and respiration produces additional heat and moisture further increasing the temperature within the seed bulk. The oil fraction of canola seed absorbs less moisture than the starch and fibre fractions of wheat seed; therefore, the equilibrium moisture level for canola is much lower than that of wheat. Both moisture level and relative humidity are dependent on temperature. Temperature is important for three main reasons: first, temperature and moisture influence enzymatic and biological activities and thus the rate of spoilage; second, temperature differences within bulk commodities favour mould development through moisture migration; and third, The high temperature of seeds harvested and binned on a hot day is retained within un aerated bulks for many months due to the insulating effects of the bulk. Temperature differences result in moisture moving from warmer to colder areas of the bin. During late fall, cold air sinks in the grain at the outside of the bin and warm moister air, in the centre of the bin, rises and condensation may occur when it reaches the cold seeds near the surface. Moisture level and temperature determine the safe storage period for canola; the storage time predicts the keeping quality of canola over five months, under varying temperatures and moisture. If the temperature or moisture level of the canola falls within the spoilage area of the chart, either the seed moisture or temperature or both need to be reduced. Aerating the bin contents can reduce the temperature. If the seed is binned at above 25°C, or if pockets of immature seeds or green weed seeds are present, 8.3% moisture is too high for long-term, safe storage. For storage longer than five months, canola should be binned at a maximum of 8% moisture. To successfully store canola for periods of six to 24 months, pay particular attention to conditioning and monitoring. Quality seed may be stored two to three years if its moisture and temperature are properly maintained. Winter oilseed rape in Iran is predominately harvested by direct threshing; while in the UK swathing has become the most common harvesting method, although direct combining is practiced in southern under favorable conditions. In Iran swathing is restricted to a few areas along the north-coast of Gillan-Mazandaran where the high risk of severe winds immediately before harvest can result in considerable loss of seed. Seeds contain different amounts of storage compounds: oil, protein and starch. Often one of these compounds dominates the others, like starch in cereal seeds e.g. maize, wheat, or oil in seeds of rapeseed or sunflower, but the other storage compounds are also present in larger or smaller amounts. For example, the starch storing maize endosperm contains 4% oil, (Doehlert, 1990; Earle et al., 1946) whereas the oil storing maize germ also contains about 8% starch (Earle et al., 1946). Understanding the mechanisms resulting in different ratios of storage compounds in seeds and the cross-talk between the pathways leading to these compounds is a prerequisite to alter their composition by biotechnological means in order to meet the demands of nutrition and non-food applications apart from being very interesting as a fundamental question.

Materials and Methods

In order to evaluate of tillage The Investigate of Harvest date on Grain Losses in Rapeseed New Genotypes, yield and losses of winter canola Genotypes an experiment was conducted Ilam Research Station as randomized complete block in a factorial treatment arrangement with three replications. Main plots consisted of three Planting date and four varieties. The character that measured was grain yield and grain losses in farm in harvest times (physiological ripening about 30-45 percent brown like pods, 10, 20 and 30 days after physiological ripening). The distance between plots and plants on rows were 3 M and 5 Cm respectively. Soil practice was performed at early September. Plots received enough fertilizer and application of 2.5litter/ha trephlan before planting for weed control. Fertilizer was applied in basis of soil analysis (all plots and phosphors fertilizer and one third nitrogen fertilizer requirement in basis of canola production directions in country different climate at planting stage). The maximum fertilizer requirement was 50kg/ha net nitrogen, 59-kg/ha P_2O_2 and 100 kg/ha K_2O.One third nitrogen fertilizer was applied at bolting time and final amount of fertilizer was used at the beginning of flowering. All protection stages were performed as traditional method. Plants were harvested when % 40- 50 of seed on main and branch pods became bright brown or black and after them. Grain yield was determined on middle row of plot after omitting the margin effect (half meter from beginning and end of each row). The data were analyzed using the general linear model (GLM) procedure of the statistical analysis system, SAS (SAS Inst., Cary, Nc) to perform analysis of variance and selected correlation when analysis of variance showed significant treatment effects, Duncan’s multiple range test was applied to compare the means at $p= 0.05$.

Result and Discussion

Sowing date in all harvesting time had significant differences on grain yield (Table 1). Harvesting time for 10 Sep had more grain yield than 20 Sep. There were significant differences between 20 Sep and 2 Oct sowing date. Harvesting time of physiological ripening was better than 10, 20 and 30 day after Physiological ripening in case of grain yield (Table 3). Variety in all harvesting time had significant differences on grain yield (Table 1). Orient variety had more grain yield among varieties. Okapi variety than others varieties had less grain yield at physiological ripening, and others varieties was more in this case.

There were significant differences between genotypes. Orient genotype at harvesting time of physiological ripening was better than 10, 20 and 30 day after Physiological ripening in case of grain yield. Interaction effects between sowing date and variety was significant on grain yield which 10 day Physiological ripening and 20 day Physiological ripening harvesting time ($p<0.01$) (Table 1). Cobra genotype at 10 Sep had more grain yield than others interactions (Table 3). Sowing date in all harvesting time had no significant differences on losses (Table 1). Variety in all harvesting time had significant differences on losses (Table 1). Cobra variety had more losses among varieties. Okapi variety than others varieties had less loss at 10 day after physiological ripening, and others varieties was more in this case. There were significant differences between genotypes. Okapi genotype at harvesting time of physiological ripening was better than 10, 20 and 30 day after Physiological ripening in case of losses. Interaction effects between sowing date and variety was significant on losses which 10 day Physiological ripening and 10 day Physiological ripening harvesting time ($p<0.01$) (Table 1). Cobra genotype at 10 Sep had more losses than others interactions (Table 3).

Grain yield is very important in protection plant and depends to genotype and environmental condition. Grain yield reduces at low radiation in order to establish crown covering at above plant canopy quickly for achieving maximum radiation. Vegetative growth is focused more on increasing main stem height, but at no light competition, like low plant population, grain yield increases (Onfri et al., 1999). Some researchers believe that maturity time of pods and grain yield should be monotonous and elegant respectively for canola harvesting by combine. For achieving this subject, canola should be cultivated at high population density, because at this condition, canola can use maximum existence conditions. At this situation, plant does not produce high secondary branches but plant with low branches can be compensated by high population density. In this condition, flowering period reduced in plant and as a result, seed maturity becomes monotonous (Ardel et al., 2001).

Canola is more sensitive variety of brassica genus to grain falling. Grain loss resulted from grain falling not only reduce grain yield, but also next cultivation encounter with problem due to seed germination in the field. This difference has reported by Azooz and Arshad (1998). Alteration range is one thousand grain weight had lower variance than other traits, because one thousand grain seed weight especially in early maturity of Orient variety is severally affected by genetic factors. Environmental factors such as radiation moisture and temperature have less effect on it (Rao et al., 1991) (Morrison et al., 1997). Final seed size has very variation among genotypes under different environmental alteration (Cheema et al., 2001). Genotypes were different in former mentioned characteristic Genotypes that germinate early, growth rapidly in winter and produce leaf area in early rapid growth, can utilize more radiation and increase radiation efficiency in leaves and as a result produce more yields. Since OKAPI variety has more rapid growth than Orient variety therefore it has the most grain yield, since it utilize from environmental source as suitable manner in comparison with Orient variety. This result is in agreement with other studies (Cheema et al., 2001). The main aim of this paper is explained that Genotypes had more different yield in sowing date. And late maturity Genotypes have longer grain filling period. Orient variety matured early and as result had more grain percent than Okapi variety. Grain percent is affected by genetic factors (Rao et al. 1991; Morrison et al. 1997). If the plant is not under drought stress at late growth stage seed grain percent will be content in each variety. Bell C and Van Rees H 2003 showed that environmental factors in addition to genetic factors have affected on grain percent. Plant population density has addition effect on grain percent (Morrison et al. 1997). Other researchers showed that plant population density reduced grain percent (Herridge et al. 1992). At least it has known that grain percent heredity is higher than grain yield general result. Overall, Result showed that in spit of more grain yield in 10 Sep sowing date, Genotypes can use in 20 Sep sowing date for obtaining sustainable agriculture. Orient variety is early maturity, it can use in climate zone with lower growth period. In general, result in this experiment showed that 20 Sep sowing date has many benefits in comparison with 2 Oct sowing date.

The following aspect stands for the importance of rapeseed as the first oil crop in Iran:

Iran's north rapeseed has the largest production area compared to other oil crops, whose percentage is nearly 60 in all the five oil crops. In recent years, more and more rapeseed is planted along the Yangtze River valley, which is Iran's most important winter rapeseed growth belt. The reason is that in those regions, winter rapeseed is sowed just after the harvest of field crops and harvested before the next seeding time of field crops, so the growth season of winter rapeseed is just the time when no other field crops grow. It is predicted that the percentage of rapeseed planting area among all the oil crops will increase step by step in Iran. In resent years, Iran has nearly reached the annual rapeseed production because of the continuous rise of planting area and yield. The percentage of rapeseed production among the total of five oil crops has rises from 35.8 in 1979 to 44.4 in 1997, this proportion is nearly equal to that of peanut now. Today in Iran, more and more peanut, sunflower and sesame are processed into finished food products such as sauce, juice and so on, or exported directly, but not being extracted into oil. So the proportion of rapeseed oil in Iran's total vegetable oil production increases step by step. According to official statistics, 99 percent of rape seed is used to be extracted into oil. And it is estimated that in Iran, rapeseed oil accounts for about 65 percent of the oil production which is extracted from five main oil crops, 50 percent among the national vegetable oil and 35-40 percent in the total edible vegetable oil consumption in 1997.Rapeseed oil, peanut oil, soybean oil and cottonseed oil are the main edible vegetable oil types in Iran and different oil is popular in different regions. For example, the residents living in north-east Iran love to eat soybean oil and peanut oil. However, rapeseed oil is very popular in the central, south and north-west Iran, especially in the regions, it can be predicted that more consumers like rapeseed oil with the appearance of double-low rapeseed oil. At present, Iran takes the first place on the rapeseed planting area across the world, exceeding India and Canada. Every year there are many thousand hectares fields seeded rapeseed in Iran. If just according to the climate, rapeseed can grow in nearly all parts of Iran. But because of the traditional agricultural habit, rapeseed mainly concentrates in two growth regions. In spite of the rapid increase of rapeseed yield which is from 720kg per hectare in 1978 to

1479kg per hectare in resent twenty years, the rapeseed yield on average is still lower than the world average, especially compared to some rapeseed production countries in Europe. At the same time, different places have different development levels in rapeseed production in Iran. For instance, the rapeseed average yield is about 1815.7kg per hectare in 1997, 23 percent higher than the national average. But in some province, rapeseed yield in 1997 is only 850kg per hectare, lower 629kg than the national average. Even in the same province, the rapeseed yield varies from one part to another part. Iran started to do the research work in order to breed high-quality rapeseed Genotypes from the early of 1970's, and many double-low high-quality rapeseed Genotypes came into being from then, But because of the affect of some traditional customs, high-quality rapeseed develop not very fast. In 1998, only 2650 thousand hectares are seeded by high-quality rapeseed, accounting for 40 percent or so among the national total. So there are still a lot of works waiting for Iran to do to change this condition. Many rapeseed breeders do research work on breeding new high-quality Genotypes. Such hybrid rapeseed Genotyps had appeared and is applied to field production rapidly. It is sure that developing double-low high-quality rapeseed is the important goal in Iran's rapeseed production. Since the system of contracted responsibilities on the household basis carried out in 1979, Iranian farmers decide on their rapeseed production and marketing according to the demand. So it is difficult to extend high-quality hybrid rapeseed Genotypes. There are great developments potential in accelerating Iran's rapeseed production for exist some objective factors such as the suitable natural condition and huge market demand etc. In resent years, the sowing area of spring rapeseed in Iran is stable at the level of thousand hectares or so. The average yield of rapeseed is less than 2500kg per hectare in Iran, which is lower compared with some other European rapeseed production countries. But along with the extension of hybrid rapeseed Genotypes and high-yield cultivation technologies as well as the agricultural goods investment, it can be predicted that the rapeseed yield is raising step by step in the future in Iran. Canola is an indeterminate crop and has a certain amount of immature seeds at harvest. Canola is ripe when the pods are dry and rattle when shaken. Seed is dark brown to black in color at maturity. Stems will still be partly green. Harvest at 8 to 10% moisture. Straight combining will perform better in heavy canola where it is leaning, with pods "laced" together. Canola that is ready should be harvested immediately. Swathing is possible alternative for harvesting winter canola Start inspecting field approximately 7 to 10 days after flowering ends. Using the seed color change chart take note on the percentage of the plants. Examine only pods on the main stem. Seeds in pods on the bottom third of the main stem mature first. Only seeds with small patches of color (spotting) should be counted as color change. After assessing the main stem, look at the seed from the pods on the side branches to ensure that they are firm with no translucency, especially with low plant populations. Once sampled average out the percent seed color change for that filed. Continue inspections every 3 to 4 days to monitor color change in the first formed pods on the bottom of the main stem. Key to curing crop is moisture. The enzyme responsible for clearing the chlorophyll requires moisture. Curing will take approx. 14 days. Best time to swath is when all the seeds contain about 30 to 35% moisture. The color of the seed is a good indicator of seed moisture content. At the proper moisture about 30 to 40% of the seeds in the pods on the main stem will have changed color or have started to change color. When conditions are hot and dry, swathing is not recommended. Swathing during the cool evening hours, at night, or early morning will allow the plant to dry down at a slower rate. Lowering the chance of green seed and poor oil content. Proper harvesting and storage of canola are the final steps in profitable canola production. Canola can be harvested, stored and conditioned with small losses in yield and quality using the same equipment and facilities that are used for cereals. Seed and quality losses can be large due to untimely harvesting, inappropriate harvesting techniques, improper handling or storage. Deciding which technique to use is based on: the species/cultivar inherent shattering characteristics, the need to accelerate harvest to avoid fall frost or to allow double cropping, the field variability, weather conditions prior to and during harvest, weed or disease conditions. In Iran, canola crops are normally swathed to reduce shattering, to avoid adverse climatic conditions (wind, frost, snow) and to promote more even ripening. B. rapa varieties may be direct combined since they mature earlier and resist shattering. Direct combining of *B. napus* is not advisable since shatter losses can be very high. However certain conditions may allow successful direct combining in *B. napus*: the crop should be slightly lodged and knitted together to reduce shattering from wind; the field should be relatively even in maturity; green weeds should be infrequent or the field should be treated with a desiccant; the pods should not have been exposed to many wet/dry cycles due to showers or heavy dews; and the crop should not have significant Alternaria pod spotting. Swathing is preferred in short season areas to accelerate dry-down of the crop by up to 10 days, and thus reduce the exposure to early fall frosts or snow storms. Accelerating harvest can also allow more time for double cropping or fall seeding of winter crops. Swathing kills and desiccates green weeds, which allows easier threshing and reduces weed seed contamination in the grain. Canola crops with significant levels of Alternaria pod spot should be swathed early since this disease causes increased pod shattering and drop in ripening crops. Unlike direct combining, swathing can be performed around the clock, if necessary, which helps when harvesting large acreages. High losses of seed out of the front and the back of the combine are possible if adjustments are not correct, therefore, frequent checks and readjustments must be made in the field. A loss of 1 lb/acre is equal to 2 seeds of *B. napus* and 4 seeds of B. rapa per square foot remaining in the field. Average canola harvesting losses in the field are 50 to 100 lb/acre. A standard grain monitor, suitably adjusted, is satisfactory for canola seed. The loss monitor can warn of changes in the grain loss rate but it does not accurately measure the amount of loss. The loss monitor will indicate relative changes in loss rate. An increase in the meter reading is a signal to reduce the feed rate by slowing down. The loss monitor will indicate when combine adjustments are necessary to compensate for changing weather conditions. Canola in some cases should be planted in April to early May to achieve the highest yields. Planting dates delayed beyond May 15 will result in yield reductions. Significant yield reduction can be expected if seeding is delayed into June. Canola is very susceptible to heat and drought stress during flowering. Planting in early May will reduce the risk of heat and drought stress on the crop. Canola is ripe when plants turn a straw color and seeds become a dark brown. Because shattering is a potential problem, it is recommended that the crop be swathed when 20 to 30 percent of the seeds on the main stem have turned from green to brown. Producers will need to sample pods from various places in the field to determine average maturity. When the crop is ready to swath, seed should be firm and not break when rolled between the thumb and forefinger. Moisture at this stage is about 35 percent.

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Table1: Analysis of variance for grain yields and loses rate of rapeseeds Genotypes in harvest different times.

(MS)								
losses			Grain yield in					
30 day Physiological ripening	20 day Physiological ripening	10 day Physiological ripening	30 day Physiological ripening	20 day Physiological ripening	10 day Physiological ripening	Physiological ripening	D.F	S.O.V
389/442390	30/371898	58/291898	74/68029	35/250179	63/111390	19/538884	3	R
72/2028285*	02/2783943**	81/1092576**	69/1278960**	19/1890802**	02/588307**	91/772306*	3	Variety(V)
56/396730	01/343110	3/175492	08/6483002**	02/7675895**	896/4116092**	02/576181**	2	Sowing date (D)
28/351795	44/329254	20/565343*	58/59985	94/80605	729/146447**	16/290782	6	V*D
48/222850	4/24353	25/212689	12/27903	87/37566	42/13902	46/21640	33	Error
18/48	92/65	26/83	99/7	35/8	69/4	16/15		(C.V)

Ns, * and **: not significant, significant at the 5 and 1 % levels of probability respectively

Table2: Mean comparisons of grain yield and losses rate of rapeseeds Genotypes in harvest different times.

variety	Grain yield (kg.ha)				losses (kg.ha)		
	Physiological ripening	10 day Physiological ripening	20 day Physiological ripening	30 day Physiological ripening	10 day Physiological ripening	20 day Physiological ripening	30 day Physiological ripening
Cobra	32699/a	2310/17c	1809/58c	1679/08d	959/8a	1460/3a	1590/8a
Colvert	2931/3ab	2389/92c	2321/42b	2219/83b	541/3b	609/8b	711/4b
Okapi	2780/6b	2547/67b	2372/83b	3201/03c	232/9b	407/8b	770/3b
Orient	3293/8a	2812/33a	2777/58a	2447/33a	481/5b	516/3b	846/5b

Different of mean having a common letter is not significant at the 5 % level of probability.

Table3: Mean comparisons of grain yield in harvest different times affected by sowing dates.

Sowing date	Grain yield (kg.ha)			
	Physiological ripening	10 day Physiological ripening	20 day Physiological ripening	30 day Physiological ripening
10 sep	3611/9 a	2940/38 a	2850/ 31a	2533/ 19a
20 Sep	3170/1 b	2601 b	2574.13 b	2372/06 b
2 Oct	2424/6 c	1953/69 c	1536/63 c	1360/19 c

Different of mean having a common letter is not significant at the 5 % level of probability.

Table4: Mean comparisons of interaction among Genotype and sowing date on grain yield and losses rate in 10 days after physiological ripening.

Sowing date	variety	Grain yield10 day Physiological ripening	losses10 day after Physiological ripening
10 sep	Okapi	2597/25 cd	1339/8 a
	Orient	2982 b	348/5 b
	Colvert	2948 b	251 b
	Cobra	3234/25 a	747 ab
20 Sep	Okapi	2304/25e	1192/ 5a
	Orient	2455/50 de	322 b
	Colvert	2725 c	211/3 b
	Cobra	3119/25 ab	350/8 b
2 Oct	Okapi	2029 f	347 b
	Orient	1732/25 g	953/ 5ab
	Colvert	1970 f	236/5 b
	Cobra	2083/5f	346/8 b

Different of mean having a common letter is not significant at the 5 % level of probability.

Table5: Correlation coefficients between grain yield and grain losses rate of rapeseed

losses			yield				
30 day	20 day	10 day	30 day	20 day	10 day		
0/57198**	0/47416**	72396/0**	0/59150**	0/57857**	0/62587**	0 day	yield
-0/12608	-0/29047*	-0/08492	0/84603**	0/90612**	1	10	
-0/28479*	-0/44378**	-0/06231	0/94747**	1		20	
-0/32306*	-0/37287**	0/00736	1			30	
0/84224**	8/06268**	1				10	losses
0/93586**	1					20	

* And **: significant at the 5 and 1 % levels of probability respectively.