Available online at www.scholarsresearchlibrary.com

Scholars Research Library

Scholars Research Library

Annals of Biological Research, 2012, 3 (5):2399-2404
(http://scholarsresearchlibrary.com/archive.html)

Annals of Biological Research
Scholars Research Library
ISSN 0976-1233
CODEN (USA): ABRNBW

Effect of gamma rays on pod and seed production and economic yield in pinto bean cultivar of Khomein

Hamid Nouri*[1] and Abolfazl Tavassoli[2]

[1]Department of Agriculture, Yasuj Branch, Islamic Azad University, Yasuj, Iran.
[2]Department of Agriculture, Zahedan Branch, Islamic Azad University, Zahedan, Iran

---

ABSTRACT

Quantitative and qualitative crop increase is one of the most important basic and fundamental objectives in plant breeding. Generally used techniques of mutation and irradiation is gamma ray. A research was performed in the experimental field of yasouj Islamic Azad University, in 2008, in collaboration with the Atomic Energy Organization of Iran and the nuclear medicine department of Shiraz Namazi Hospital was performed. Due to low permeability and lack of ability to produce doses of high radiation X, the gamma-ray from cobalt 60 at doses (zero as a witness, 3, 6, 9, 12, 15, 18 and 21 Gy) was used to identify the intensity of radiation desired for understanding the changes desired phenotypic, morphological and physiological Pinto bean seeds on Khomein cultivar relative humidity from12 to14 percent were used which in this experiment a part of this research will be discussed. The results showed that exposure on the number per pod, seed number and economic yield in the 1 percent level of significance. The highest pod production with 326.3 number/m^2 to 3 Gy dose and the lowest pod production with 108.3 number/m^2 to 21 Gy dose of radiation intensity. The highest seed production related to the dose of 3 Gy with 1565 seeds /m^2 and the lowest grain yield with 520.8 seeds/ m^2 to 21 Gy dose was observed. The most economical yield was with 570.8 gr seed /m^2 to the lowest dose of 3 Gy and economic performance was with 204.5 g seed/m^2 to 21 Gy dose respectively.

Key words: Economic yield, Gamma rays, Pinto bean, Seed production.

INTRODUCTION

The supply of food safety is one of the main problems that some of countries are faced on it with increasing of crowed, the amount of requirements of food materials increased, and it showed the importance of agriculture and the role of using the modern techniques production of the crops and food process.

Nuclear techniques is one of the techniques that show a peaceful usage in most of agriculture and environment aspects like genetic variation and plant improvement, aspect of yield, quality, making resistance, optimizing the fertilizer consumption, reduction of poisonous and pests consumption, optimizing of water consumption, soil conservation, protecting of agriculture products, and most of other aspects of practical and successful usages.

The increase of the quantitative and qualitative yields is one of the most important basic and fundamental objectives in plant breeding.
For achieving to this important is required to the major gens that carried out the quantitative and especially qualitative yields.

In several last decades, multi nations companies have basically changed the genetic situation of plants with the rectification, production and reproduction of the seeds of agriculture plants.

It means that this institutes with the production and selling these seeds in all over the world, local cultivars which have usually high and low quality, caused to destroy and reduction of millions of local plants cultivar in all over the world. As a result billions of rich gens destroyed which there were created in process million years of natural evolution and thousand years of selective rectification of early human.

The best sample in this case is the rice cultivars high yield and low quality on cucumber cultivars with high yield but with no taste and smell, or straw berry cultivar with high yield and beautiful and large appearance, with lack of good taste and aromatic smell.

Of course it should be mentioned that these quantitative successes, which has been positive contact on the field of fighting to starvation in different countries of the world, almost had been compatible with qualitative approaches, for example corn cultivars has been rectified that their protein quality, with increasing of vital amino acids such as Lysine has been improved.

In any way, for these activities a lot of gens has been sacrificed which spoke about the genetic shortage and genetic corruption.

Anyway, the only way for substitution of these destroyed and valuable gens and chromosomes is creating of artificial mutation of gen and chromosome.

The scientific attempt of different countries in the world has been caused to significant successes with using of these methods, and the most of these successes is in quantitative section.

As regards to mentioned advantages in using of nuclear techniques in different field of agriculture natural sources, attempt and consideration of government and industries is essential for achieving to the development and technology of required facilities, and also for developing of these technology in Iran.

Nuclear agriculture has no relation to the Uranium subject. It include of everything which is related to the Isotopes and Radio Isotopes (Brock, 1976).

For achieving to a stability cultivars and for collecting the valuable and economic features by common ways in plants rectification which are gen remover or stability gens from parents to the children and mostly for lack of required genetic variety, this work is so difficult with low approach.

There is different ways for making variation in the plant genetic features. It is one of the creating ways of gen and chromosome-mutation, and the usage of irradiation techniques during last years has been one of the common ways with good result.

Mutation can be made in different ways that one of these ways is using of Gamma radiation.

Basically, Gamma radiation is one of electro magnate, and for having very low length and very high vibration has more permeability and energy rather than radiation (Piri et al., 2011).

This radiation achieves from nuclear radiation of some radio Isotopes, such as cobalt 60 and cesium 137. Gamma radiation has permeability and is very dangerous. The sources of this radiation for seed irradiation is in the form of Gamma cell and for plant irritation in the condition of small room, green house or in the field is used as Gamma Green house, Gamma field and Gamma room.

Lots of factors have an effect on genetic mutation that it change by change of humidity even in a mount of -2 to -3 percent.

And also the changes of humidity level caused to create of some changes in plant physiology genotypic and phenotypic process which can identified the optimum doses of Gamma radiation intensity and it also can use of it. This radiation intensity can be appeared in different seeds and plants and also in different conditions. Different scientific have used of nuclear techniques in some of pulse cultivars, and complete conclusion and basic usage of these experiments will achieve by tissue cultivation, in F2, F3 and F4 generations of conducted self-pollination and integrated fertility.

In some of pulse cultivars used of nuclear techniques which is required for continuing the work and creating new cultivars with more advantages (Majd and Ardakani, 2003).

Pinto bean is one of tasty seeds, and it is from leguminous family. Dry and ripe seeds have high nutrient value and good preserved capability, and they are one of the important food sources which are full of protein (18 to 32 percent).

The food consumption of bean with cereal can remove starvation and also lack of amino acid. On the other hand, as a regard to the root relation of this plant with rhizobium bacteria there is the ability of nitrogen fixation in this plant. Therefore locating these plants and other leguminous plants in cultivated alternation can help to the resistance of cultivated systems.

Among the pulse, bean has the most range of under planting in the world. In Iran, this plant is in a range which is about 89 thousands of hectare, and from this kind of bean is obtained 140 thousands hectare.

Among the pulse, pinto bean has highest yield average with yield average of 2100 kg/ha rather than other pulse, in Iran.

This crop with having 32 percent protein can be a good substitution for meat with high nutrient value.

The morphologic and genetic features of bean cultivars are a conclusion of spices evolution during the history of before being domestic, being domestic, and after being domestic.

The intensive variety reduction of some features in planting of bean cultivars caused to do complex procedure on germplast tests (Bagheri and Mahmoudi, 2001).

Bean in different region of Iran, usually harvested after wheat and rapeseed cultivation, and for this reason is considered as important plants in crops rotation. So, bean cultivar is important for maximum use of the growth season and on time harvesting and preventing of harvested stages contact with autumn precipitation.

Other important goals of bean improvement increased the amount of protein yield and percentage, amino acids, biological value of protein, and the resistance of bean plants against environment stress, pests and diseases.

It seems that for substituting of losing gens, different spices of plant is required to accelerate of genetic mutation artificially, which has been invented different methods for these goals.

As regards to something mentioned at above, the necessity of doing studies and researches about issues and problems which is related to Legumes will be felt.

The most important strategy in rectification based on mutation, is increasing the optimum capability of plant variation, by changing in one or two main features.

The study of irradiation effects on plants is an extensive and complex issue. Gamma radiation has effected on the growth and evolution of plants with creating of cytologic, genetic, and biochemical and physiological changes in cells and tissues (Gunckel and Sparrow, 1961).

The production of mutant has successfully used in rapeseed and Mustard for changing the genetic structure of plant by rectifiers.

Mutants with optimum economic features like plant longitudinal growth, the number of sheath in each plant ,the number of seed in each sheath, the weight of thousands seeds, high yield, amount of oil and resistance on the disease, were separated.

With study of different doses irradiation of Gamma ray (0 to 20 GY) on 3 variety of Chinese cabbage founded that low doses of ray, have significant effect on the growth parameters and irradiation of low doses is associated with germinating extension (Kim et al., 2004).

The aim of this research is investigating gamma rays on production pinto bean, cultivar of Khomein in Yasuj region.

MATERIALS AND METHODS

One of the successful and experimented methods is using of mutation and irradiation techniques with use of Gamma ray. In a research was performed in the experimental field of Islamic Azad University of Yasuj, in 2008, in collaboration with the atomic Energy Organization of Iran and the nuclear medicine department of Shiraz Namazi hospital was performed.

Due to the low permeability and lack of ability to produce high doses in X radiation, the Gamma radiation from cobalt 60 was used to identify the intensity of radiation described for understanding the changes desired phenotypic, morphological and physiological on pinto bean seeds of Khomein cultivar.

Pinto bean of Khomein cultivar, after humidistat in soil laboratory and having humidity between 12 -14 percent was poured into the sealed packets which showed the kind of seeds, the number of seeds, and the rate of radiation, and each packet is located in determined distance of radiation source.

Irradiation with Gamma ray which is obtained of cobalt 60 in stimulating doses with the intensity of zero irradiation as control 3, 6, 12, 15, 18, 21 (GY) was performed in nuclear medicine deportment of Shiraz Namazi hospital.

Irradiation with Gamma ray for each treatment is accountable according to the following formula; the length of irradiation time (GY in a second). Base on set power, is cleared the time of irradiation.

Used irradiation set has a power which is equal to 1 (GY) in 985 minute. For creating of mentioned radiation intensity, the length of following radiation time was done and accounted: for radiations of 3 GY 2.95´, 9 GY 8.86´, 12 GY 11.82´, 15 GY 14.77´, 18 GY 17.72´ and 21GY 20.67´ was done.

Immediately after irradiation, seeds had been already cultivated at the frame of block on a field with 1500 m^2 area in 4 replications in June 2008.

The providing stages of cultivated practices including sole experiments, providing of cultivated base such as plow practices, Disc, leveler, the rate of required fertilizer, and creating of rows in a distance of 50 cm from each other and the distance of seed planting on a row which is 40 cm with a density of 10 plant in square meter.

Irrigation was done every 7 days. Then, the required features and characteristics was done and different data and information was recorded. Finally after the stage of cultivation, was done crop harvest, and the number of pod, the number of seed and economic yield in square meter was recorded as an average of 5 bushes in square meter in every replication, and after required conversion data was analyzed by use of SPSS software (Noori, 2009).

RESULTS AND DISCUSSION

The analyses of variance and the studies of different doses of Gamma radiation on pinto bean in this experiment show a significant different between different levels of Gamma rays (P<%1) (Table 1).

Table 1. The analyses of variance of different doses of Gamma radiation on pinto bean

SOV	df	The number per of pod	Seed number	Economic yield
		Mean square		
R	3	1262.208**	29249.115**	13582.206**
Gamma radiation	7	19375.054**	445450.353**	59307.149**
Error	21	264.994	6082.662	1416.414
CV (%)		7.95	7.94	9.91

**, ** significant at the 1% levels of probability respectively and n.s (non-significant).*

As regards to the advantages in different doses is cleared that after control treatment (without deterrent irradiation) the most of averages in 3 doses (GY) and the less averages in 21 doses was seen for feature of pod numbers, seed numbers and economic yield (Table 2).
With increasing the rate of pod, seed production, and economic yield reached to the highest level in 3 (GY) doses, then it diminished to 21 (GY) doses, and in 21(GY) reached to the lowest its amount (Table 2).

Table 2. Mean comparison of different doses of gamma radiation on pinto bean

Dose (GY)	The number per of pod (m^2)	Seed number (m^2)	Economic yield (g)
0	275.8 b	1324.0 b	528.0 a
3	326.3 a	1565.0 a	570.8 a
6	228.5 c	1098.0 c	424.1 b
9	190.3 d	912.0 d	359.8 cb
12	178.0 d	854.3 d	320.3 c
15	174.8 d	839.0 d	332.4 c
18	155.8 d	748.0 d	299.3 c
21	108.3 e	520.8 e	204.5 d

Mean followed by similar letters in each column, are not significant at the 1% level of probability.

Totally it can be concluded of above experiments, the radiation intensity of 3 GY doses is considered, and the optimum radiation intensity.

We hope that, at the next experiment with use of F1 seed in this experiment, with control contacts, achieved to the good results for increasing of qualities if different yield of plants.

REFERENCES

[1] Bagheri, A and A. Mahmoudi. **2001**. Cultivation and breeding of bean. Mashhad Daneshgahi Jihad Press. Pp: 214.
[2] Majd, F and M. R. Ardakani. **2003**. Nuclear technics in agriculture sciences. Tehran university press.
[3] Noori, H. **2009**. Evaluation of effects of gamma radiation in different irradiations intensity in process of qualitative and quantitative variations of seeds of pinto bean, Khomein cultivar. Msc thesis of agronomy. Islamic Azad University, Yasuj, Iran.
[4] Brock, R. D. **1976**. *Basic Life Sci*. 8: 17-32.

[5] Gunckel, J. E and A. H. Sparrow. **1961**. Ionizing radiation, Biochemical, Physiological and Morphogical aspects of their effects on plants. In: Encycl. Plant physiol. (ed) W. Ruhlad. XVI: PP. 555-611.
[6] Kim, J. S., M. H. Beek, Y. K. Lee and Y. I. Park. **2004**. *Radiation Physics and Chemistry*, Vol. 42, Nos. 4-6, PP. 799-805.
[7] Piri, I., M. Babayan., A. Tavassoli and M. Javaheri. **2011**. *African Journal of Microbiology Research*, 5(32): 5806-5811.