

Evaluation Some Germination Characteristics for Buckwheat Seeds Under Experimental Ecology Conditions

Ibraheem M. Aliyas*, Ghanim Y. Kassim*, Najah N. Mutlak**

*Technical Institute of Mosul- Iraq

** Ministry of Higher Education And Scientific Research-Iraq

Abstract- This research was conducted to study the several methods for evaluation the germination on Buckwheat seeds *Fagopyrum esculentum* M. Polygonaceae family, which seeds produced from Ukraine, under optimum experimental ecology conditions by planting 50 seed in each of four replications, the results appearance that the mean of germination percentage was 90%, average vigor germination 24,5% on the basis of first count, average the speed of germination was 2,4 day/ seed, average the index of germination was 11,7, average speed coefficient of germination was 6,4 seed / day, agricultural value 88,8%. Which that shows through above calculations to experimental germination characteristics. we can conclude that buckwheat seeds carry a genetically and good physiological properties which awarded high efficiency of seeds germination, this consider a clear indication of the possibility of its planting on the field and experimental level, after confirming ensure of its high productivity in the unit per area within Iraqi environmental conditions, for the possibility of adopting an economic alternative crop. In view of importance the plant at the following aspects; high nutritional value, medical value, ecological value as a cover crop to limit desertification in special wild types of plant by its self-seeding ability, a large surface of vegetative area and short life cycle of the plant also as a forage crop, as honey production crop and its value in farming rotation. Seeds yield were 2500Kg/hectare in the productive countries.

Index Terms- Buckwheat, Germination characteristics, Experimental ecology, Alternative crop.

I. INTRODUCTION

Buckwheat was summer field crop belonging to family Polygonaceae, consider the region of Asia (China) its original habitat, the farming of plant was spread in warm areas of the northern half from earth planet, has been known since more than 4000 years. It grows in large areas of northern India, China and Korea then transferred to the central areas of South Asia, Europe and Russia in the first century, then transferred to Europe, North America and finally to Africa, China, Russia and Ukraine are among the most producing countries, where in Russia are cultivated in wide areas which estimated about 2 million hectares at average of production 2,500 tons / ha, including 18 species in China [1,2,3]. The buckwheat seeds were introduced to the country of Iraq from the Ukraine for the purpose of laboratory and field researches for possible

dependence an agricultural crop after verification of the success of cultivated through scientific research. The seeds of buckwheat medium-sized, three-shape, gray in color or black ranging in length 3- 6 mm, the weight of thousand grain 26-32 gm., seeds are rich in protein 16%, carbohydrates 62%, sugars from 3.0 to 5.0%, oil 3%, fiber 14% and contains some salts of metal such as iron, calcium, phosphorus, copper, zinc, boron, iodine, nickel, cobalt also contains organic acids and some vitamins such as PP, P, B2 and B1 [4, 5]. The Buckwheat was richest in protein, has a greater nutritional value from cereals proteins where like characteristics of legume proteins in terms of digestion, characterized oil compounds in seeds resistance to oxidation thus helping to easy of storage operation and conservation for a long time. As a result of the global towards for alternative crops to harmonious with population growth for achieve food security and sustainability of energy flow therefore it requires the development of new crops then sustainable development of cultivation and the same is highly nutritious for the sustainability of life and improving the health status of the human being to strengthen the immunity system to resist diseases, embodiment of the argument (your medicine your food). Buckwheat seeds are used widely in producing countries, as a chief food meal and alternative of rice, wheat crop and preferably used on rice crop in some countries to their important productivity, food, medical and environmental. Also, wild-type which uses as crop green cover to reduce the phenomenon desertification which called cover crop for the large surface area of the vegetative, its distinguish in phenomenon of Self seeding and also called Honey production crop, while the density of flowers where plant produces up to 750-2000 flower that the nectar of flowers aromatic this making bees visit in more case, which increases the productivity yield of seeds per area unit because of the additional pollination. Its importance for medical distinguished by containing a substance Rutin is the glycosides compound which are used for treatment of atherosclerosis, high blood pressure, diabetes and obesity treatment (slimming) [6,7]. Due to the length life cycle of the traditional cereal crops, such as wheat and rice, which are considers a major food source of human, because of the less productivity of some of their varieties, deterioration of genetic traits and changes in the global environment, so it requires the diversification of food sources relying on alternative crops characterized by short life cycle, efficiency of the productivity, quality is superior in food composition and curative and medicinal value such as buckwheat, where the plant complete life cycle during (60) days for some varieties depending on the

environmental ocean prevailing in the cultivated area so as to viability plant to abstract soil elements and the concentration of dry matter by 70% during a month [7]. So is an integrated research program for this crop starting from laboratory research to evaluate some of the properties of germination and Research adapting the plant to the Iraqi environmental ocean which reprises from dates of planting and plant density to determine the economic, nutritional, curative and ecological importance by expand green cover to improve the environmental situation and reduce desertification.

II. MATERIALS AND METHODS

Conducted a laboratory research in the Department of Plant Production - Technical Institute / Mosul-Iraq on 3/10/2013 by the cultivation four replications seeds of buckwheat crop in germinator, where the seeds were taken randomly by 50 seed per Petri dish and distributed uniformly in the surface area of the Petri dish by using the filter papers as a medium farm of germination under environmental conditions of laboratory set temperature germinated by 25 °C which is optimum temperature for germination, the replications were monitoring daily. Found the seeds germinated in the third day on 5/10 after 72 hours from seeds planting, where held germinated seeds account as of the

first count 5/10 until the last count 11 / 10 for a period of seven days and recorded the number of seeds germinated, was watering dishes daily by rate of 1 ml per a seed to cover the water requirement for ensure the germination whether more irrigation water causing the growth of fungi then seeds rot and germinate failed, adopted the emergence of the embryo from the seed and the emergence of part of the radical and penetration of seed coat the case of germination in the calculation of seeds germinated from the first count to the last count, the seeds were in good properties in health status also not notice the injury agricultural pests by health testing of seeds, weighed 1000 grains of the sample reach the weight 26.3gm, the result of get germination process and through data recorded been studied the following properties.

Germination percentage

The **germination percentage** means the average number of seeds germinated for four replications under optimum conditions of temperature 25 °C, suitable moisture and light for germination on the total number of seeds calculated by percent during the time period 7 days for the duration of germination was calculated according to the following equation:

germination percentage =

$$\frac{\text{Number of seeds germinated in last count day from germination for each replication}}{\text{Total number of seeds for each replication}} \times 100$$

- Germination **percentage** for the first replication = 84%
- Germination **percentage** for the second replication = 96%
- Germination **percentage** for the third replication = 92%
- Germination **percentage** for the fourth replication = 88%
- Average of germination Percentage for the four replications = 90%

Germination vigour :

It means the number of seeds germinated under optimal conditions of 25 °C with suitable moisture and lighting in the first count of the germination on the total number of samples,

regardless of the time period to germinate been calculated according to the following equation calculations as the seeds germinated rate in the last count for the four replications (45) seed is calculated on the basis of the total count 50 as follows :

Germination vigour

$$= \frac{\text{Number of germinating seeds in the first count}}{\text{Total number of seeds}} \times 100$$

- G.V first replication = 30%
- G.V second replication = 26%
- G.V third replication = 18%
- G.V fourth replication = 24%
- G.V average = 24.5%

Germination Speed = Total (number of germinated seeds every day × number of day) / number of germinated seeds at the end of the test period

$$\text{Germination speed} = \frac{N1 \times T1 + \dots + Nn \times Tn}{N1 + N2 + \dots + Nn}$$

Where N: number of seeds germinating every day, T: number of days when its germination obtain .
 germination speed for first replication = 2.6 day
 germination Speed for second replication = 2 day
 germination Speed for third replication = 2.7 day
 germination Speed for fourth replication = 2.3 day
 germination Speed for the four replications = 2.4 day / seed rate

Germination index:

Germination index was estimated by calculates the number of seeds germinated(N) from the first day of planting on 3/10 to up the last count 11/10 for a period of nine days the number of days (T) from the date of planting for each counting as in the following calculation equation: -

$$\text{Germination index} = \frac{N1}{T1} + \frac{N2}{T2} + \frac{N3}{T3} + \frac{N4}{T4} + \frac{N5}{T5} + \frac{N6}{T6} + \frac{N7}{T7} + \frac{N8}{T8} + \frac{N9}{T9}$$

Germination index for the first replication = 10.6
 Germination index for the second replication = 0.12
 Germination index for the third replication = 10.6
 Germination index for the fourth replication = 11.1

That seeds which its germination index was higher or more consider the speed (the vigour of germination) was highest index germination which reached. [7,8].

Coefficient of speed germination :

speed germination coefficient means the average number of seeds germinated for the four replications under laboratory germination conditions on the number of days since the beginning of germination 5/10 until 11/10 were seven days has been calculated according to the following equation:

$$\text{C.S.G} = \frac{\text{Average number of seedling}}{\text{Days number}}$$

C.S.G for the first replication = 6 seed
 C.S.G for a second replication = 6.8 seed
 C.S.G for a third replication = 6.5 seed
 C.S.G a fourth replication = 6.2 seed
 Total average = 6.4 seed / Day
 This also reflects average of daily germination

Agricultural value :

The tests of germination laboratory always be under optimal environmental conditions cannot be predicted in field which is not be guarantee of truth germination for open farming , where gets variation in the characteristics of germination between the two cases so requires the study of the agricultural value of the seeds depending on the percentage of germination in the laboratory after knowing the ratio percentage of the purity was 98% , note that there is the standard agricultural value for seeds was 90% within the packaging specifications and the application of the following equation :

$$\text{Agricultural value of the seeds} = \frac{\text{Purity percentage} \times \text{Germination percentage}}{100}$$

Agricultural value of seeds = 88.8%

This is an indication on use of the amount of seed per area unit , that whenever reduced standard agricultural value should be increase seeding rates on the basis of area unit, and that the recommended amount for the unity dunum from the seeds of buckwheat (15) kg / dunum in production countries , where can calculate the amount of corrected seed by the application the following equation:

$$\text{Corrected Seeding amount} = \frac{\text{Stander of agricultural value} \times \text{Average of recommended seeding}}{\text{Agricultural value of laboratory}}$$

Corrected Seeding amount = 20.5 kg / dunum

There are other tests conducted for seeds such as electrical conductivity of the soaked seeds , mean of daily germination, , test the value of germination , test seed viability , testing of the Peak value and mean germination time as was mentioned [9]. Table(1) clear some data about material and method of research, as mentioned both [10,11].

Table (1) indicate the some information about the nature of laboratory work.

Replications	Seeds number	Planting date	Germination date	Water amount ml/day	Seedling total of last account	Germination days number
1	50	3/10	5/10	50	42	7
2	50	3/10	5/10	50	48	7
3	50	3/10	5/10	50	46	7
4	50	3/10	5/10	50	44	7

III. RESULTS AND DISCUSSION

Through from germination tests can assess the degree of seeds viability, determine the quality of seeds directly by their efficiency for germination under conditions of optimum germination, heat, moisture and light, in this study germinated seeds (seedling) calculated by the system during the time period for germination and recorded from the first count to the last count, as in Table (2) this mentioned by [11]. Table (3) indicates to all studied properties, where the percentage of germination in the last count that in the seventh day which reached 90%, where is considered High-rate acceptable, this guide to the viability and effectiveness of the embryo and the possession of high-capacity in the succession of generations then the sustainability of the system life, so it can be recommended to conduct field research of buck wheat as of adaptation to Iraqi environment ocean, which represented by dates of planting, plant density, their responsiveness among in the medium different of soil interaction and to other factors in order to adoption the plant as crop agricultural economist to achieve food security within a sustainable agricultural crop techniques. Through the note vigour of germination, which is considered one of the standards evaluation of seed germination regardless of the time period amounted 24.5%, as a third of the number of seeds germinated after three days of farming 3/10,4/10,5/10 assessed as being high percentage it was a suitable ratio, this refers to the activity of seed tissue, the strength of the embryo

qualities and good Genetic, physiological properties for water absorption and enzymes effectiveness in transfer of the complex seed components to simple substances for supply the seedlings by gesture food and the emergence of the embryo in the optimal conditions for germination as confirmed by [11],reached speed rate of germination 4.2 Day / seed, germination index rate 11.7, that the higher of (G. I.) gives a form of the strength and speed of germination by higher degree this evidence with [9], when measuring the speed coefficient of germination which is about the average of germinated seeds number for duration of the germination test 7 days which was found 6.4 seed / day, which is acceptable scale for recommend to planting the seeds of the crop this pointed by [12,13],this consider a time-average of the germination, this indication that the seeds not delay in germination because the delays sometimes causes a failure of germination and the lower plant density by the reason of injury by soil fungal diseases, for example as (fusarium,alternaria,phytophthora) as well as capture the seeds by soil insects, this indicates that the speed of germination of seeds has to qualify to conduct field research in the future, this is consistent with the findings of the [9]. The final resultant in germination tests are estimating agricultural value which reached 88.8% was high value in the degree of evaluation of this status and by which they can find out the amount of corrected seeds on the basis of area unit after knowing the standard quantity of used seeds per area unit which that the amount was 15 kg / acres in the producing countries, China, Russia and Ukraine.

Table 2 indicates the number of germinated seeds from the first count to the last count in the four replications

Replications/ count	First count	Second count	Third count	Fourth count	Fifth count	Sixth count	Seventh count	Total	Public average %
first	15	14	6	1	2	2	2	42	84
second	13	17	14	2	2	0	0	48	96
third	9	14	17	0	2	2	2	46	92

fourth	14	18	6	0	2	2	2	44	88
---------------	----	----	---	---	---	---	---	----	----

Table (3) refers to some characteristics of germination under laboratory conditions

Characteristics/ Replications	% average of germination	% average of vigour germination	Average of speed germination- day/seed	Average of index germination	Average of coefficient speed germination
first	84	30	2,6	10,6	6,0
second	96	26	2,0	12	6,8
third	92	18	2,7	10,6	6,5
fourth	88	24	2,3	11,0	6,2

REFERENCES

- [1] J .C .Rana , 2004 ,The Geography distribution of wild buckwheat of Yunnan Province of china ,P. , 265-270
- [2] Speciation of Fagopyrum tataricum Inferred from molecular data ,2003 , Ludmila M Moiseenko ,Valentina F . Pedochenko .
- [3] Tristan F . Sail . K , 2003 , Development and characterization of R F L P Marker from Buckwheat esculentum M .P.,342 .
- [4] Michat . Proposition for a Buckwheat quality research program , Fagopyrum 8 ,1988 , P . ,54-56 , Poland .
- [5] Sun L . K , Yang K .S .Jong J . , and Cheol H.P . , 2001 , Development and utilization of Buckwheat Sprouts as functional vegetables . Fagopyrum 18: 49-54 , (2001) , Korea
- [6] A . P Lahanov , R . S . Muzalevskaia , 2003 , Germination Improved the nutrient value of Buckwheat ,P. , 599 .
- [7] Asian Journal of Pharmacy and Life Science ,Vol . 4 , Oct- Dec , 2011 ,ISSN 2231- 4423 , Available . com .www.Agplsonline on
- [8] Ying J . , Clayton G . , 2000 ,Breaking dormancy in Buckwheat , Fagopyrum 17 : 45 – 50 (2000) Kade , Research , Ltd . Morden , Manitoba , Canada .
- [9] K . C . Gairola , A . R . Nautiyal , 2011 , Effect of Temperature and Germination Media on Seed Germination of Jatropha Curcas ,Linn . V: 2 , Issue 2 , Dec . 2011:P . , 66-71 .
- [10] Talib A . Issa, Mohammed A. Hussein, 1988, Test of seeds and propagate, Ministry of Higher Education and Scientific Research, Technical Education, Iraq, p, 273- 307
- [11] Abdulla Q. Alfakree, Ahmed S. Khalaf, 1983, crop seed production and quality, Ministry of Higher Education and Scientific Research, University of Mosul, Iraq, pp:150-155.
- [12] Seed net . gov . in / Material / Handbook of seed /Chapter % , 2013 , Pdf , P . ,242 -249 .
- [13] 13 –Mavi , K .Demir , Matthews , S . ,2010 , Seed Science and Technol . , 38 , P . ,14 – 25 , Ankara , Turkey .

AUTHORS

First Author – Ibraheem M . Aliyas, Technical Institute Of Mosul- Iraq
Second Author – Ghanim Y. Kassim, Technical Institute Of Mosul- Iraq
Third Author – Najah N. Mutlak, Ministry of Higher Education And Scientific Research-Iraq
 Email:Aboesamalnaser@yahoo.com