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Present Status of Buckwheat Genetic Resources in Nepal

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1. Introduction

Buckwheat (*Fagopyum* spp.) is one of the minor food crops of Nepal; it occupies an important place in Nepalese agriculture and contributes greatly in food supply in remote areas. However, buckwheat is an under-exploited, poor people's and neglected crop in Nepal. Common buckwheat (*F. esculentum*) and tartary buckwheat (*F. tataricum*) are two cultivated species and the other buckwheat (*F. cymosum*) is wild one. These are found in different parts of Nepal; and buckwheat is mainly cultivated in mountainous region. Some recent reports indicate the existence of few more buckwheat species in Nepal, but in depth studies are needed for the validity of their presence. Different species, sub-species, ecotypes, populations, varieties and biotypes of buckwheat are found in Nepal, which indicate a great deal of buckwheat variability here. So, Himalayan region is considered one of the centre of diversity of buckwheat. Limited local landraces from Nepal have been used, but the extent of work is limited, incomplete and lack of continuity.

2. Early Buckwheat Germplasm Work

Before 1951, Nepal was forbidden country, and except Indian people other were restricted to enter Nepal. But when India was occupied by Britishers, they started to penetrate Nepal by entering here for different purposes. All the British people entering Nepal were not scientists, but they saw the plant genetic resources in Nepal and started collecting them, evaluated elsewhere and published the accounts in the different forms during 1825 to 1949 period. However, the noted plant scientists could not visit Nepal even though they assumed that Himalayan region was very rich in plant genetic resources; and written document about buckwheat germplasm works before 1951 has not been found.

When Nepal was freed in 1951 from Rana autocracy, it was opened for mountaineering teams and diplomatic relation was established with many countries, the flow of foreign nationalities increased tremendously during fifties. Different people tried to understand the different aspects of this part of the Sangrila region. People of the world started to know the vast diversity of plant genetic resources of Nepal.

Historically, a Japanese expedition team of scientists travelled Nepal during 1952 to 1953 and collected seeds of Nepalese crops and flora, and published the information in the book called "Land and Crops of Nepal Himalaya" in 1956. This book provided a comprehensive description about the crops, flora and climate of western Nepal. The team collected buckwheat seeds and evaluated in Japan (4).

From the beginning of early sixties, several germplasm collection teams or individuals visited Nepal and collected Nepalese buckwheat landraces from different parts and carried out in-depth studies on the specific subjects. Nepalese buckwheat landraces have been studied and used in Japan.

3. Recent Works on Buckwheat Germplasm

This phase started from the beginning of the seventies upto now. Department of Agriculture / Nepal, in collaboration with USAID / Nepal, collected seeds of cultivated crops from 27 districts of Nepal in 1971 (14). S.N. Lohani was the team member of that exploration; and it is believed that buckwheat seeds also were collected; and he evaluated the buckwheat landraces probably in 1973 and used for buckwheat improvement program. Thus in Nepal, Lohani was the first man to collect, evaluate and utilize buckwheat landraces from 1971 to 1973.

Akio Ujihara, Professor of Shinshu University, Japan visited Nepal for about two months from the late September of 1975 in eastern and central hills and some plain areas of Central Development Regions. His main mission of visiting Nepal was to collect and study Nepalese buckwheat landraces and to record the agricultural practices. He collected 34 common, 43 tartary and 14 wild buckwheat population in 1975 (16, 17). Ujihara was studying the geographical distribution of common buckwheat; and when he observed the buckwheat variability in Nepal, he was fascinated with Nepalese buckwheat to find out many clues about the origin of buckwheat. So later on, he regularly visited Nepal every year from 1980 to 1986 and collected many landraces and information about buckwheat. He published many articles about Nepalese buckwheat, and he even used these materials for his Ph. D. dissertation in 1983 (16). So, Ujihara is the pioneer of collecting and using of Nepalese buckwheat landraces, and popularized Nepal for the plant genetic resources to outside world.

Ohmi Ohnishi, Professor of Kyoto University, Japan also visited Nepal in 1986 and he used Himalayan buckwheat landraces for his allozyme studies from 1983 to 1993 and published many articles about Himalayan buckwheats. Thus he further highlighted Nepalese buckwheat genepools around the world; and buckwheat scientists are familiar with Nepalese buckwheat resources. He established many facts about Nepalese buckwheat (5, 6, 7, 8, 9, 10, 11, 12,).

The collection, evaluation and documentation of buckwheat landraces started long ago, but the authentic records are available from very recent only. This is mainly because all the works were done by foreigners for specific purposes and until now Nepal is not paying any attention in this field.

4. Buckwheat Germplasm Collection in Nepal

The collection of buckwheat germplasm might have been started long ago in 1802 (4) but the records of recent years only are available. Although, Japanese scientists collected many buckwheat germplasm from early fifties, very little is known about the number of collections, the evaluation, documentation and conservation, except some references in the scientific papers. The Nepali scientist S.N. Lohani collected some buckwheat landraces, unfortunately, the complete record is not available. During the eighties IBPGR, Rome, recognized Nepal for her germplasm and involved in collecting Nepalese plant genetic resources and organized a multi-crop collection mission in 1984, 1985 and 1986 in collaboration with Japanese government. Information of some collections are available from 1984 onward. Again IBPGR/USAID deputed a Japanese student S. Yanagihara in 1985 to collect germplasm of different crops for more than 2 years in Nepal. When National Hill Crops Research Program (NHCRP) was established in 1986, it started collection, evaluation, documentation and utilization of buckwheat germplasm. Also USAID provided funds for collection and evaluation of common buckwheat germplasm to IAAS Rampur for the period September 1990 to September 1994 (13). The present status of buckwheat germplasm collection is given in Table 2.

Table 2. Nepalese buckwheat germplasm collection records.

S.N.	Team / Name of Collecters	Sponsor	Collection Year	Number of Sample Collected	Evaluation Year	Remarks
01.	S.N. Lohani	USAID / Nepal	1971	NA	1973	
02.	IBPGR, Multi-crop Collection Team -1984	Japan	Nov.1 - Dec. 12, 1994	59	1986, 1989, 1990	
03.	IBPGR, Multi-crop Collection Team -1985	Japan	Oct. 8 - Nov. 26, 1985	151	1986, 1989, 1990	
04.	IBPGR, Multi-crop Collection Team -1986	Japan	NA	NA	NA	
05.	S. Yanagihara	USAID / Japan	Oct. 1985 - Jan. 1987	90	1989, 1990	
06.	NHCRP, Kabre	Nepal	1987 - 1992	85	1992	
07.	NHCRP, Kabre	Nepal	1993	27	-	
08.	M. Yoshida	JICA / Japan	1989 - 1992	50	1992	
09.	Buckwheat Research Project (Trib. Univ.)	USAID / Nepal	1990 - 1993	288	1992, 1993	Only Common type
10.	NHCRP, Kabre		Different	507	1992	All Available upto 1992

5. Evaluation, Characterization and Documentation of Buckwheat Germplasm

Ujihara (16), Ujihara and Matano (19), Ohnishi (5, 10, 11, 12), Tulachan (15), Rajbhandary (13), Baniya et. al (1, 2, 3) and other people also evaluated Nepalese buckwheat germplasm and documented the information in detail. Although, S.N. Lohani also evaluated the buckwheat germpalsm in 1973 for limited traits to use in varietal improvement program and some landraces were evaluated in 1986 for agronomical traits, but the detail information of both studies are not available for general use.

Ujihara evaluated 16 Nepalese common buckwheat landraces, originated from different places in 1976 at Shinshu University, Japan. Data are presented on days to flowering, plant height, no. of branches, clusters and grains per plant. He found all Nepalese buckwheat cultivars strong autumn type (16) and a lot of variation was observed. Tulachan also evaluated Nepalese tartary buckwheat populations; and found a lot of variation in grain color, shape, size and texture and other morpho-agronomical characteristics. He provided many photos of grains (15).

Baniya et. al. (3) evaluated 155 (75 common and 80 tartary) local landraces in 1989 autumn and 1990 spring and characterized and documented them by using IBPGR descriptors for 23 traits (autumn 1989). The findings of this study were presented in national and international meetings (1, 2, 3). During 1992 autumn season NHCRP evaluated a total of 507 (common 309, tartary 196 and wild 2) using IBPGR descriptors for 27 traits, but the detail report is yet to publish. Again B.P. Rajbhandari evaluated and characterized 288 common buckwheat at five agro-ecological regions of Nepal for 19 traits, and documented the results under Buckwheat Research Project, TU/USAID joint venture for the duration between 1991 to 1994 (13). Ujihara and Matano (1982) evaluated Nepalese wild buckwheat (19).

6. Conservation of Nepalese Buckwheat Landraces

Right now, NHCRP headquarters is storing more than 534 buckwheat landraces at Kabre in the ordinary storage condition; some cultivars are stored at Khumaltar in medium term storage and at Godawari in deep freeze. The first set of 155 landraces and about 507 lines of another set of buckwheat cultivars are being stored in Canada with Campbell's supervision at long term storage condition. Again, all the landraces collected in 1984, 1985 and 1986 multi-crop missions are stored in Japan in the form of originally collected samples. Similarly, all the samples collected by Yanagihara and Yoshida and most of the samples collected by NHCRP teams also were sent and or taken to Japan for further study, use and conserve in the University of Shinshu and University of Tsukuba, Japan. B.P. Rajbhandari also is conserving 288 common buckwheat cultivars in ordinary store at Kirtipur, Nepal by multiplying the seed every year (personnel communication).

7. Utilization of Buckwheat Landraces

The available variability in Nepalese buckwheat genetic resources is only partially used, and a lot can be done in this respect. After evaluation of buckwheat landraces, some of the tartary populations were promoted to a variety, and other were improved by following the individual plant selection, some of the common buckwheat cultivars were used in varieties improvement program by crossing with other lines and following the recurrent selection method. Japanese buckwheat scientists are using Nepalese buckwheat germplasm in the number of academical studies, however, they are not using these materials in varietal improvement for Japan, because Nepalese landraces are not suitable for their conditions (16). B.P. Rajbhandari is using the common buckwheat landraces to identify superior ecotypes for breeding purposes, in-vitro culture technique and other academic purposes. Nepalese buckwheat genepools can be used in the development of stress resistant or tolerant varieties, more branching and taller plant type genotype (13).

8. Recent Protocol of Buckwheat Germplasm Research in Nepal

The collection, evaluation, characterization, documentation, preservation and utilization of plant genetic resources of all crops are the responsibility of Nepal Agricultural Research Council (NARC). NARC has assigned Plant Genetic Resource Unit of Division of Agricultural Botany to conduct regular exploration in collecting crop germplasm, assigning passport data and other regular works about plant genetic resources of all crops. However, this unit is not doing any thing about buckwheat germplasm expect storing and small scale collection; and NHCRP is taking lead in handling and using of available buckwheat germplasm.

Tribhuwan University, Nepal also is working on buckwheat germplasm research on the USAID funded project basis. However, her objective is rather academic than buckwheat improvement and conservation. This university is not responsible to buckwheat landraces research and it worked on adhoc basis only (13).

9. Conclusion

Nepal is rich in buckwheat genetic resources but its different aspects are poorly understood and documented. This human heritage has not been widely studied, used and preserved in spite of rapid erosion from its native places. Need of global attention for the proper care of this valuable wealth.

References

1. Baniya, B.K. Riley, K.W. and Dongol, D.M.S. 1990. Characterization of local landraces of buckwheat and finger millet, 1989/1990. Hill Crops Workshop Proceedings. NHCRP-NARC, Nepal.
2. Baniya, B.K., Riley, K.W., Dongol, D.M.S. and Sherchand, K.(K), 1991. Characterization and evaluation of Nepalese buckwheat germplasm 1990/1991. Hill Crops Workshop Proceedings. NHCRP-NARC, Nepal and Proc. 5th Intl. Sym. on Buckwheat, Taiyuan, China, 1992.
3. Baniya, B.K., Riley, K.W., Dongol, D.M.S. and Sherchand, K.K., 1992. Characterization of Nepalese hill crops landraces. (barley, buckwheat, finger millet, grain amaranth, foxtail, proso and barnyard millets). NHCRP-NARC. Nepal and IBPGR, Rome.
4. Kihara, H. (Editor), 1956. Land and Crops of Nepal Himalaya. Scientific results of the Japanese Expeditions to Nepal Himalayas. 1952-1953. Vols. I and II. Fauna and Flora Research Society, Kyoto University, Japan.
5. Ohnishi, O. 1985., Population genetic of cultivated common buckwheat, *Fagopyrum esculentum*, Moench. IV. Allozyme variability in Nepali and Kashmirian populations. Jap. Jour. Gen. 60(4). Japan.
6. Ohnishi, O. 1992., Buckwheat in Bhutan. Fagopyrum. Vol. 12. Ljubljana.
7. Ohnishi, O., 1986. Evaluation of world buckwheat varieties from the view points of genetics, breeding and the origin of buckwheat cultivation. Proc. 3rd Intl. Symp. Buckwheat. Pulawy, Poland.
8. Ohnishi, O., 1991. Discovery of the wiled ancestor of common buckwheat. Fagopyrum. Vol. 11. Ljubljana.
9. Ohnishi, O., 1983. Isozyme variation in common buckwheat, *Fagopyrum esculentum* Moench. and Its related species. Proc. 2nd Intl. Sym. Buckwheat. Miyazaki, Japan.
10. Ohnishi, O., 1989. Cultivated buckwheat species and their relatives in the Himalaya and southern China. Proc. 4th Intl. Sym. Buckwheat. Orel, USSR.
11. Ohnishi, O., Year (?), Worldwide survey of allozyme variability in common and tartary buckwheat populations. A concluding remark. Lab. Genet. Facl. of Agriculture, Kyoto University, Japan.
12. Ohnishi, O. and Nishimoto, T., 1988. Population genetic of cultivated buckwheat, *Fagopyrum esculentum* Moench V. Further studies on allozyme variability in the Indian and Nepal Himalaya. Fagopyrum Vol. 8. Ljubljana and Jap. Jour. Genetic. 63. Japan.
13. Rajbhandari, B.P. and Hatley, E., 1993. Exploitation of genetic yield potential of common buckwheat (*Fagopyrum esculentum*) ecotypes in different regions of Nepal. Annual Report - 3 (15 July 1992 to 14 July 1993). The office of the Science Advisor, USAID, Washington

D.C., USA.

14. Sherchand, K. (K), Shrestha, T.B. and Rachie, K.O., 1986. Hill Crops improvement program in Nepal. IDRC/Canada, ARPP/USAID and HMG/Nepal. A Consultancy report.
15. Tulachan, G.S. 1989. Studies on characterization of tartary buckwheat (*Fagopyrum tataricum* Gaertn.) collected in Nepal during 1987. Lab. Crop Sc. and Plant Breeding. Facl. of Agriculture, Shinshu University, Japan.
16. Ujihara, A., 1993. Studies on the ecological features and the potential as breeding materials of Asian common buckwheat varieties (*Fagopyrum esculentum* M.). Lab. Crop Sc. and Plant Breeding. Facl. of Agriculture, Shinshu University, Japan.
17. Ujihara, A., 1989. A preliminary report on geographical distribution and characteristics of cultivated buckwheat genus *Fagopyrum* in Nepal. Exp. and Collect Plant Genetic Resources. Part I. JICA, Tokyo.
18. Ujihara, A. and Matano, T., 1975. The agronomical research of buckwheat in Nepal. Overseas Field Res. Collected Ref. 1972-1976. Japan.
19. Ujihara, A. and Matano, T., 1982. Distribution and morphological variation of wild buckwheat (*Fagopyrum cymosum* M.) in Nepal. Dept. Crop Sc. Plant Breeding. Facl. of Agriculture, Shinshu University, Japan.
20. Ujihara, A., Matano, T. and Miyazaki, T., 1976. Geographical distribution and agronomical research of buckwheat (*Fagopyrum esculentum* M.) in Nepal. Jour. Facl. of Agriculture, Shinshu University, Japan. (In Japanese with English summary).