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INFLUENCE OF CORN (*ZEA MAYS* L) SEED PROCESSING WITH A LOCALLY PRODUCED SHELTER ON SEED QUALITY AND THEIR DAMAGE

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Abstract

Maize (*Zea mays* dis.L.) is one of the most important staple crops in the world. Sindhupalchok, Kavre and Nuwakot were the three districts selected for the maize CBSP groups under the respective Agriculture Development Offices identified by CDD for the present study. Altogether 2x6x3 samples for the study were collected. Seed damage as broken seeds, damages on embryo, seed quality assessments like seed moisture content, pure seed percentage, seed vigor measured by root and shoot length, seed germination, and embryo damages were carried in seed testing laboratory in Seed Science & Technology Division (SSTD) Khumaltar following the ISTA Rules, 2007. For the embryo damage test, tetrazolium salt test (TZ) was conducted following the procedures prescribed for maize seed in ISTA Rules, 2007. All the samples possessed of 99 % of pure seed. It ranged from 99.51 % in Nuwakot to 99.96 % in Kavre for samples using corn sheller. They were found within the standards for pure seed and were of acceptable range. The corn sheller was found as efficient as that of hand shelling. There was not found the effect on the quality of seed that they were within the standard values. The germination percentage decreased from initial 96 to 85 (Kavre); 94 to 87 (Sindhupalchwok) and 91 to 83 (Nuwakot). This study concludes that the corn sheller techniques offer Wooden corn sheller is a simple but traditional device made locally for shelling the maize kernels and distributed to Community based seed production (CBSP) farmers contribute to minimizing the impacts of hand sheller on agricultural systems.

Key words: maize corn sheller, hand sheller, CBSP Group, seed quality analysis

Introduction

Maize (*Zea mays* dis L.) is one of the most important staple crops in the world. It is also the second important food crop in Nepal, that more than 45% of the population in mid-hill and high-hills considers maize meal to be their survival food. Community Based Seed Production (CBSP) is a sustainable agricultural phenomenon implied in hill and high-hills of Nepal under the Hill Maize Research Program in collaboration with Nepal Agricultural Research Council (NARC); CIMMYT, Nepal; Directorate of Crop Development (CDD), with the objective to produce quality seeds of maize at local level and to increase the use of improved quality seeds and eventually increase the crop production.

Harvesting and post harvest handlings in maize include shelling, seed cleaning, drying, grading, processing's, seed treatments etc are the important agricultural operations that we put efforts on seed crop to preserve the initial seed quality, try best to receive seed properly, and follow proper drying and processing. It is

known to farmers, seed growers, seed technologists that any mal function of seed at these stages causes seed damage and reduce germination and germinability. Seed vigor is an important quality attribute which determines the longevity of seeds in storage. Reduction in seed vigor is associated with embryo damage, broken seeds and various damaged spots on seed. Mode of harvesting, receiving the seed crop, drying the cobs, shelling the seeds, seed processing and seed storing are the critical periods in production of quality seeds of maize. Seed damage is therefore an important factor that leads to losses in percentages of pure seed, plant density, and infestation of undesired microorganism that finally causes the thinning of plant stand and decrease yield per unit area. It is therefore important to educate farmers in CBSP on handling and receiving the seed crop from field to storage.

Corn sheller is a simple locally made device for the ease of shelling the maize cob. In order to promote the device and make the maize seed production and supply under CBSP efficient, the project is provisioned to

provide the corn shellers for shelling the previously harvested and dried cobs. The farmers in *Kavre*, *Sindhupalchok* and *Nuwakot* were provided the corn sheller distributed by CIMMYT, Nepal. The objective of this project is therefore to determine the effect of these corn shellers on seed quality and find out the right seed moisture for shelling cob in local corn sheller.

Methodology

Sindhupalchok, *Kavre* and *Nuwakot* were the three districts selected for the maize CBSP groups under the respective Agriculture Development Offices identified by CDD for the present study. From each districts, six CBSP farmers were strategically sampled using both the mechanized corn sheller and hand sheller. Two samples of seeds (one with corn sheller and other with hand sheller) from each of sampled farmers were collected. Altogether 2x6x3 samples for the study were collected. Seed damage as broken seeds, damages on embryo, seed quality assessments like seed moisture content, pure seed percentage, seed vigor measured by root and shoot length, seed germination, and embryo damages were carried in seed testing laboratory in SSTD, Khumaltar following the ISTA Rules, 2007. For the embryo damage test, tetrazolium salt test (TZ) was conducted following the procedures prescribed for maize

seed in ISTA Rules, 2007(Handbook of seed testing ISTA 2007).

The storability of these seed samples in terms of moisture content, germination, field emergence and embryo damage using TZ test was also tested after a season long storage in ambient condition (Handbook of seed testing ISTA 2007).

Results & Discussion

Effect on physical quality of seed

In the purity analysis, the test samples across the study districts showed no significant effect of shelling on seed quality (Table 1) all the samples possessed of 99 % of pure seed. It ranged from 99.51 % in *Nuwakot* to 99.96 % in *Kavre* for samples using corn sheller. They were found within the standards for pure seed and were of acceptable range. Likewise in seed moisture content, there was not observed the effect and there was also not observed the broken seeds in the form of inert matters. However, there is an obvious observation of shelling effect on embryo exhibited by the staining of embryo parts with TZ solution (table 1 and Fig. 1)The embryo damages were found higher in all the samples across the study districts compared to the samples shelled by hand. The sample of *Nuwakot* was found highly affected with 6 damaged embryos out of 100 seeds tested for TZ.

Table 1: Average seed moisture contents, pure seed percentage and embryo damage percents of maize seeds showing the effect of shelling with corn and hand shellers (2067/68).

Districts	Seed moisture (%)		Pure seed (%)		Embryo damage (%)	
	corn sheller	hand sheller	corn sheller	hand sheller	corn sheller	hand sheller
<i>Kavre</i>	15.4	15.7	99.96	99.96	3.4	1.6
<i>Sindhupalchowk</i>	15.1	15.1	99.84	99.92	3.7	1.5
<i>Nuwakot</i>	15.5	15.5	99.51	99.65	6.0	3.0

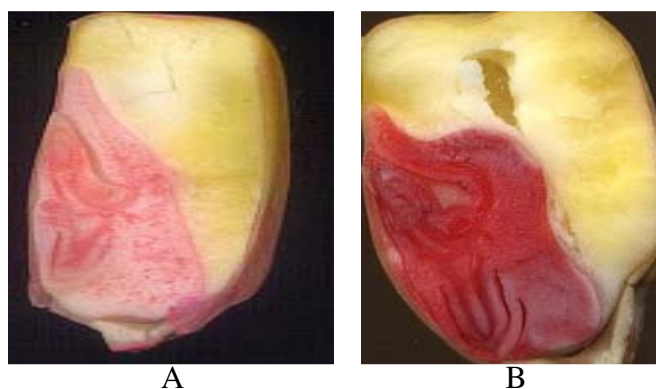


Fig. 1: A high vigor seed as indicated by the staining pattern of red spots on a white background. All critical seed structures are stained, and there is no damage present in the embryonic axis (B); Areas of the scutellum are often bruised as seen near the base of the scutellum (A).

Table 2: Average germination, field emergence and seed vigor in terms of root and shoot length of maize seeds showing the effect of shelling with corn and hand shellers (2067/68).

Districts	Germination (%)		Field emergence (%)		Root length (cm)		Shoot length (cm)	
	corn sheller	hand sheller	corn sheller	hand sheller	corn sheller	hand sheller	corn sheller	hand sheller
<i>Kavre</i>	96	96	90	99	16.1	14.2	19.1	19.2
<i>Sindhupalchowk</i>	92	94	87	97	17.0	16.4	26.0	26.5
<i>Nuwakot</i>	92	93	91	92	14.1	16.2	19.0	20.0



Fig. 2: Germination test of corn seed in SSTD laboratory .

Table 3: Average values of seed quality attributes of test samples of maize showing effect of corn sheller on storability after a season long storage (2067/68).

Districts	Seed moisture (%)		Germination (%)		Embryo damage (%)		Field emergence (%)	
	corn sheller	hand sheller	corn sheller	hand sheller	corn sheller	hand sheller	corn sheller	hand sheller
<i>Kavre</i>	14.0	13.3	85	91	4.2	2.1	83	90
<i>Sindhupalchowk</i>	14.5	13.3	87	90	4.7	1.3	87	89
<i>Nuwakot</i>	14.2	13.5	83	92	7.0	3.0	82	91

Effect on germinability and vigor

Table 2 and Fig. 2 shows the quality attributes of seed samples of maize using the corn and hand shellers (Bewley and Black, 1994). The corn sheller was found as efficient as that of hand shelling. There was not found the effect on the quality of seed that they were within the standard values.

Effect on storability of seed

The seed samples shelled with corn sheller were found low in quality compared to the seeds lots shelled manually (Table 3). The germination percentage decreased from initial 96 to 85 (*Kavre*); 94 to 87 (*Sindhupalchowk*) and 91 to 83 (*Nuwakot*) (Tables 2 and 3). Likewise, the field emergence also dropped while the embryo damage percent increased with the maximum 7 % in samples from *Nuwakot*.

Conclusion

Maize kernels are in general shelled from the cob manually using hands. Manual shelling of maize is labor intensive and typically takes weeks and months for shelling the manual harvest. The mechanized alternatives to shelling maize by hand are available but they are often unaffordable for subsistence farmers. Wooden corn sheller is a simple but traditional device made locally for shelling the maize kernels and distributed to CBSP farmers group. All data observed and analyzed in the present study reveals the corn sheller is equally efficient and saved the time, labours and other resources. The corn sheller could be used for maize processing and conditioning.

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