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# Studies on Seed Quality as Influenced by Pickings in Cotton MCU 7 (*Gossypium hirsutum* L.)

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The effect of picking on seed quality attributes was assessed in MCU 7 cotton a short duration variety recommended for cultivation during summer season in rice fields. The quality of seed as judged by germination, field emergence and other vigour tests was significantly better in the first two pickings than from latter pickings. The seeds obtained from later pickings can be upgraded by delinting the seeds with con. Sulphuric acid and collecting the sinker fraction only while washing the seed with water to free them from traces of acid. Occurrence of immature, insect damaged and hard seeds in higher proportions might have been the factors responsible for lowering the seed quality in the later pickings.

In cotton, development of seed is spanned over a fairly long period. Naturally, the environmental condition to which one set of bolls is exposed to is totally different from those to which another set, temporarily separated, is subjected to. This pre-harvest history of the seed exercises a profound influence on its nature and future behaviour. However, information on these aspects in respect of MCU 7, an irrigated cotton, popular in rice fallows of Tamil Nadu are scanty. A study was therefore undertaken to investigate this aspect.

## MATERIALS AND METHODS

MCU 7 cotton was raised in 45 x 22.5 cm spacing as a bulk crop during 1974 summer with a manurial application of 60:20:20 kg of NPK per hectare with N in two equally split doses, one at the time of sowing and the other at squaring stage of the crop. Other cultural operations and plant protection measures were followed as per the recommendations. At maturity, four pickings ($P_1$ to $P_4$) were given at intervals of eight days. The kapas (Seed cotton) was ginned picking wise and from the fuzzy seeds ($S_1$) thus, obtained the required quantity was delinted with commercial sulphuric acid (Narayanan *et al.* 1966) and those delinted seeds ($S_2$) which have sunk to the bottom while washing with water to free off the acid were collected and dried. The recovery percentage of sinkers on dry weight basis to the total weight of the seed lot was worked out. From the fuzzy and delinted seed samples the occurance of mature, immature, mechanically damaged and insect infected seed were counted. Then the weight of 1000 seeds, kernels and seed coats was determined on dry weight

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basis. Immediately, the seed samples were tested for germination potential in sand media in the laboratory (Anon, 1966) as well as by the tetrazolium staining technique (Delouche *et al*.1962). The seed vigour was assessed by field emergence, conductivity of seed leachate (Bradnock and Mathews, 1970) and oil and free fatty acid content (AOCS, 1945 and Karon and Altschul (1944). Vigour index was computed by multiplying per cent normal germination by dry matter production per seedling (Senthil Kumar, 1976).

RESULTS AND DISCUSSION

The results are given in Table. The percentage of germination was found to be higher in the earlier two pickings than in the later two (Panse and Khargonkar 1948 and Anthony and Tarr 1952). Albert (1963)reported seeds from bolls set in midseason to have higher germination than those from bolls set late in the fruiting season. Viability rating as assessed by tetrazolium staining also brought out the superiority of seeds realised from earlier pickings. The better performance of earlier pickings is due to the cumulative effect of factors like higher percentage of mature and healthy seeds, higher seed weight, lower proportion of hard seeds and comparatively low free fatty acid content, as against low values recorded in the subsequent pickings.

This might be because of the retardation in the translocation of photosynthates from the vegetative parts to the seeds with ageing of the plant. Besides the earlier picked seed had mechanically less damaged seeds and less insect-damaged seeds hence the higher germinability was recorded.

Thousand seed weight which was maximum in the first picking, decreased as the picking progressed. This in agreement with many early reports (Simlote and Rampal, 1967; Ndegwe and Milburn, 1974). Qureshi (1962) found no difference in seed weight between pickings but Tharp (1948) reported seed collected later in the season weigh more than those collected early. This reduction in seed weight with plant age may be ascribed to the retardation in the net assimilation rate (Farbrother, 1954) and climatic components during the fruiting period (Reddi *et al*. 1963). The better germination of early pickings may also be attributed to the higher seed weight (Ganesan, 1953).

Later pickings recorded more hard seeds and poor germiation than the early pickings (Walhood 1956). Absorption of moisture is impeded in hard seeds due to impermeability of the seed coat; Guppy (1912) contends that delayed germination is related more to seed coat characters than to the so called dormancy problems.

Vigour index was higher in the first picking and reduced in every successive picking. The comparätiely lower germination in the later pickings is also reflected in the increased electrical conductivity of their leachates. The negative correlations obtained between electrical conductance and standard germinination test ($r = -0.817$) and field emergence (-0.648) amply demonstrates the deleterious effect of increased concentration of leachates on germination.

TABLE. Comparision of seed attributes between fuzzy ($S_1$) and delinted ($S_2$) seed samples drawn from four pickings ($P_1$ to $P_4$) in cotton MCU. 7

| | $P_1$ | | $P_2$ | | $P_3$ | | $P_4$ | |
|---|---|---|---|---|---|---|---|---|
| | $S_1$ | $S_2$ | $S_1$ | $S_2$ | $S_1$ | $S_2$ | $S_1$ | $S_2$ |
| 1000-Seed weigh (g) | 89.73 | 85.47 | 84.50 | 81.17 | 80.91 | 78.38 | 78.16 | 77.54 |
| Kernel weight (%) | 56.30 | 64.00 | 54.60 | 62.10 | 55.10 | 63.00 | 53.50 | 60.30 |
| Seed coat weight (%) | 43.70 | 36.00 | 45.40 | 37.90 | 44.90 | 37.00 | 46.50 | 39.70 |
| Kernel seed coat ratio | 1.29 | 1.78 | 1.20 | 1.64 | 1.23 | 1.70 | 1.15 | 1.52 |
| Germination (%) | 62.85 (78.0) | 56.83 (70.0) | 63.13 (80.0) | 58.42 (73.0) | 48.58 (51.0) | 55.59 (68.0) | 36.48 (36.0) | 44.71 (50.0) |
| Field emergence (%) | 66.96 (85.0) | 54.13 (66.0) | 60.87 (75.0) | 56.18 (69.0) | 45.88 (52.0) | 52.85 (64.0) | 44.71 (50.0) | 52.87 (74.0) |
| Hard seeds (%) | 4.50 (0.0) | 4.50 (0.0) | 15.18 (1.5) | 13.81 (1.0) | 20.44 (4.5) | 18.18 (3.0) | 27.31 (13.0) | 24.65 (9.0) |
| Mature seeds (%) | 90.10 | 90.54 | 87.34 | 89.70 | 78.94 | 87.65 | 62.46 | 86.63 |
| Immature seeds (%) | 4.99 | 0.87 | 7.25 | 0.80 | 13.59 | 1.44 | 23.00 | 2.06 |
| Mechanically damaged seeds (%) | 4.05 | 8.23 | 3.92 | 9.18 | 3.46 | 10.03 | 5.55 | 8.79 |
| Insect damaged seeds (%) | 0.86 | 0.36 | 1.49 | 0.34 | 4.01 | 0.88 | 8.99 | 2.52 |
| Sinkers (%) | — | 61.60 | — | 58.20 | — | 48.60 | — | 42.60 |
| Floaters (%) | — | 38.40 | — | 41.80 | — | 51.40 | — | 57.40 |
| Tetrazolium rating (%) | 81 | 78 | 82 | 79 | 67 | 78 | 60 | 78 |
| Vigour index | 71.52 | 74.84 | 70.87 | 63.99 | 43.06 | 60.66 | 42.34 | 61.14 |
| Electrical conductivity (M mhos/cm²) | 606 | 565 | 593 | 558 | 622 | 574 | 771 | 631 |
| Free fatty acid | 0.131 | 0.114 | 0.177 | 0.138 | 0.232 | 0.183 | 0.319 | 0.168 |
| Oil content (%) | 22.06 | 23.00 | 22.26 | 24.60 | 21.02 | 22.38 | 18.31 | 20.18 |

| | | 1000-seed weight (g) | Kernel weight (%) | Seed coat weight (%) | Kernel seed coat ratio | Germi-nation | Field emer-gence | Hard seeds |
|---|---|---|---|---|---|---|---|---|
| Picking | SED | 0.76 | 0.68 | 0.68 | 0.049 | 1.70 | 1.20 | 2.40 |
| | CD (P=0.05) | 1.58 | 1.45 | 1.45 | 0.105 | 3.53 | N.S | 4.99 |
| Seed type | SED | 0.54 | 0.48 | 0.48 | 0.035 | 2.65 | 1.87 | 3.74 |
| | CD (P=0.05) | 1.12 | 1.00 | 1.00 | 0.072 | 5.51 | N.S | 7.79 |
| Container | SED | 1.66 | 0.83 | 0.83 | 0.051 | 0.54 | 0.10 | 0.76 |
| | CD (P=0.05) | 3.45 | 1.78 | 1.78 | 0.109 | 1.23 | 0.21 | 1.59 |

Note: Percentages of germination, field emergence and hard seeds are indicated in parantheses.

The increased electrical conductivity in the later pickings had resulted from the increased free fatty acid content. On account of the increase in fat acidity there is a decrease in total neutral and polar lipids (Koostra and Harrington, 1969).

Oil content, however, was lesser in the later pickings, being least in the last picking (Christidis and Harrison 1955). This may be due to the exposure of kapas from the standing crop to frequent precipitations amounting to 9.0 mm. during the last picking as against nil, 2.9 mm and nil precipitation received in the earlier three pickings respectively (O'Kelly and Hull 1936). Besides the lesser oil content in the later pickings as observed in the present study may also there-fore be due to their lesser seed weight (Pandey 1972).

The free fatty acid content, a reliable index of seed quality (Abdul Baki and Anderson 1972)was least in the first picking, and registered an increase with successive pickings. The low germination of later pickings might be, inpart, the outcome of increased free fatty acid content. Germination was negatively correlated ($r = -0.879$ and $-0.830$ respecetively for laboratory and field tests) with free fatty acid content (Karon and Altschul, 1944; and Roncadori *et al.* 1972).

Though references are available on delinted seeds to give better germination than fuzzy ones (Christidis, 1936; Vasilev,1965 and Narayanan *et al.*1966), in the present study, no significant difference was seen between the two seed types immediately after harvest under either laboratory or field test. It is however seen that in the third and fourth pickings, delinted seeds recorded significantly better germination than fuzzy seeds. This might be attributed to the fact that the delinted seed lot consisted only the sinkers which contain higher percentage of mature seeds. The lesser ratio of hard seeds in delinted seeds might be due to the treatment itself since treatment with sulphuric acid besides romoving the fuzz also mellows the hardiness of the seed coat (Bagavandoss, 1969). Again, the lesser incidence of mechanical damage in fuzzy seeds might be be more apparant than real since the mantle of fuzz should have obviated a closer scrutiny. The lesser 1000-seed weight and seed coat weight of seed with delinting is understandable as resulting from loss of fuzz. Hence the higher kernel weight is noticed in delinted seeds though the kernel weight per seed in both delinted and fuzzy seeds is not differing significantly.

Vigour index was the higest in delinted seeds realised from first picking and they continued to score over fuzzy seeds in later pickings also. Oil content was more in delinted seeds because of the use of only sinkers for the estimate (Ivanov 1967).

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