

POD DEVELOPMENT IN PIGEON PEA (CAJANUS CAJAN (L.) MILL. sp)

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The quality of the seed and its characters are affected by the stage of harvesting. Among several indices which have been used to determine the proper time to harvest food legumes, the age of pods (Woodruff, 1951) and the changes in physical and chemical properties of the seeds (Hoover, 1957; Hoover and Dennison, 1954; Raghunatha *et al.* 1973; Hegde *et al.* 1975) are most important. Lack of such information on pigeon pea led to the conduct of the present studies.

Materials and Methods

The investigation was carried out at the Indian Agricultural Research Institute, New Delhi, on sandy loam soils during *kharif* season of 1976 under dryland conditions, using a pigeon pea variety BS—1. The crop was raised with 25 kg N and 80 kg P_2O_5 per ha. About 4000 flowers were tagged on the day of their opening. The development of the flowers into pods was observed and once the development reached a stage when the seeds could be separated from pericarp by hand (18 days after flowering), the first stage of harvesting was fixed. One hundred pods were harvested on alternate days until full maturity. The changes in fresh and dry weight of pod and seed, per cent seed shell-out from fresh and dry pods, moisture percentage in pods and seeds and crude protein content in husk and seed were studied with maturity stages, in duplicate lots. The relative growth rate of pods and seeds was also worked out (Blackman, 1919). Correlations were computed to study the relationship of maturity stages with these characters.

Results and Discussion

Data on changes in pod and seed characters with maturity stages and the correlation coefficient values are presented in Table 1. The fresh weight of pod which was 0.547 g at 18 days after flowering increased gradually to reach the peak at 34 days after flowering (0.923g) and then declined suddenly to reach the minimum value of 0.442g at full maturity. Similar trend was noticed with fresh weight of seed which increased from 0.055g to 0.153g and then declined to 0.079 g. As against these characters, the dry weight of pod as well as seed continued to increase almost upto complete maturity. The maximum increase was noticed between 26 and 36 days after flowering and later there was gradual rise upto 42 days after flowering.

Table 1 Variations in some pod and seed characters with maturity stages in Pigeon pea

Days from sowing	Fresh weight of pod, g	Fresh weight of seed, g	Dry wt. of pod, g	Dry wt. of seed, g	% fresh seed shell out	% dry seed shell out	Moisture % in pods	Moisture % in seeds	Crude protein % in husk	Crude protein % in seeds
18	0.547	0.055	0.191	0.011	96.8	35.0	76.0	78.0	10.50	25.88
20	0.571	0.064	0.197	0.014	41.2	38.1	76.0	78.0	10.25	24.69
22	0.620	0.078	0.170	0.021	46.9	48.8	72.0	72.0	9.00	22.91
24	0.062	0.068	0.188	0.022	52.2	59.9	71.0	68.8	8.06	21.81
26	0.719	0.102	0.222	0.025	55.3	58.1	67.7	67.8	8.81	21.50
28	0.785	0.108	0.255	0.038	57.0	62.8	67.5	64.2	5.82	21.11
30	0.837	0.128	0.282	0.047	58.0	65.8	66.9	62.7	5.25	21.12
32	0.807	0.146	0.323	0.055	62.6	68.0	64.4	62.7	5.25	20.75
34	0.829	0.153	0.341	0.058	64.7	67.2	63.1	61.3	5.25	20.58
36	0.816	0.142	0.350	0.064	67.3	68.5	57.1	55.0	4.88	20.50
38	0.684	0.122	0.356	0.065	71.8	72.0	46.0	46.0	4.75	20.00
40	0.541	0.080	0.366	0.067	78.9	75.1	36.9	35.7	4.31	10.84
42	0.487	0.084	0.388	0.068	82.8	77.8	24.4	18.8	4.06	19.69
44	0.442	0.078	0.388	0.068	89.6	78.0	0.8	14.2	4.06	18.00
Correlation coefficient	-0.925	0.978	0.767*	0.979*	0.880*	0.083*	-0.906*	0.927*	-0.929*	-0.801*

The per cent seed shell-out from fresh as well as dry pods showed constant increase with the advance of maturity to reach the maximum value of 83.6 and 78.0 per cent respectively, at the time of full maturity. These findings are supported by the observations of Singh and Gupta (1972) on soy-bean, Raghunatha *et al.* (1973) on cowpea and Hegde *et al.* (1975) on gram.

The moisture percentage in both pods and seeds showed a gradual decrease with maturity. In pods, the moisture content decreased from 76.0 to 16.6 per cent and in seeds, it decreased from 79.9 to 14.2 per cent. This indicated that during later part of maturity period, seeds lost moisture speedily than the whole pod. The changes in moisture percentage are in agreement with the findings of Hoover (1957) and Hoover and Dennison (1954) on southern peas and Hegde *et al.* (1975) on gram.

The crude protein content in both husk and seed was found to decrease rapidly during earlier stages of pod development. The reduction during the last 10 to 12 days of pod development was very gradual and not so conspicuous. It is possible that during earlier stages of pod development, the rate of protein synthesis fell short of rate of dry matter accumulation resulting in dilution effect which led to rapid decrease in crude protein content.

Data on the relative growth rate (RGR) of pod and seed showed that RGR was maximum between 20 and 22 days after flowering and later it did not follow any definite trend upto 30 days from flowering (Table 2). After 30 days, however, there was sudden decline in RGR to reach the zero level at full maturity.

The fresh weight of both pod and seed were not significantly related to maturity. But the dry weight of pod and seed and per cent shell-out from fresh and dry pods presented highly significant positive relationship with advance of maturity. The moisture per cent in pods and seeds and the crude protein content in both husk and seed were negatively correlated with maturity.

Pods harvested at 34 days after flowering (63% moisture) contained fairly good amount of crude protein (20.56%) and had the highest fresh seed weight. With delayed harvestings, it was observed that there was considerable loss of fresh weight coupled with some reduction in crude protein content. Therefore, it is desirable to harvest the pods at 34 days after flowering, if the green seeds are to be utilised as vegetable. In gram, it has been suggested to harvest the green pods 23 days after flowering for utilizing the green seeds as vegetable (Hegde *et al.* 1975).

Summary

Investigations were carried out on pod development in pigeon pea variety 'BS-1' with maturity stages. Pods were harvested on alternate days

Table 2 Relative growth rate (mg/mg/day) of pods and seeds of pigeon pea

Days from flowering	Pods	Seeds
18—20	0.1082	1.3614
20-22	1.0778	2.0220
22—24	0.7646	1.0686
24—26	0.5711	1.1930
26—28	0.6909	0.7047
28—30	0.5020	1.0640
30—32	0.6809	0.7876
32—34	0.2718	0.3501
34—36	0.1290	0.4053
36—38	0.1267	0.0553
38—40	0.0967	0.1750
40—42	0.0276	0.0737
42—44	0.0000	0.0000

from 18 days after flowering to full maturity. Among the different characters observed, the fresh weight of pod and seed first increased and then decreased with advance of maturity. The dry weight of pod and seed and per cent seed shell out from both fresh and dry pods increased with maturity. As against this, moisture per cent in pods and seeds and the crude protein content in husk and seeds declined with the age of pods. Based on these observations, it would be desirable to harvest the pods 34 days after flowering if the green seeds are to be used as vegetable.

സംഗ്രഹം

BS— I എന്ന ഇനം തുവരച്ചെടിയിൽ പല മുപ്പത്തിയ കായ്കളിൽ ഗുണമൂല്യ പഠനങ്ങൾ നടത്തി. പുത്തു തുടങ്ങി 18 ദിവസങ്ങൾക്കു ശേഷം കായ് മുക്കുന്നതുവരെയുള്ള കാലത്തു ഒന്നിരാംവിട്ട ദിവസങ്ങളിൽ വിളവെടുപ്പു നടത്തി. പല സ്വഭാവങ്ങളും പഠന വിധേയമാക്കിയതിൽ കായ്കളുടെയും വിത്തിന്റെയും ഭൂക്കം ആദ്യം വർദ്ധിച്ചുവെങ്കിലും തുടർന്നു മുപ്പു കൂടുന്നതിനനുസരിച്ചു അതു കുറഞ്ഞു വരുന്നതായി കണ്ടു. എന്നാൽ ഉണങ്ങിയ കായ്കളുടെയും വിത്തിന്റെയും ഭൂക്കവും വിത്തു ശതമാനവും മുപ്പു കൂടുന്നതനുസരിച്ചു വർദ്ധിക്കുന്നതായി കണ്ടു. അതേസമയം കായ്കളിലെയും വിത്തിലെയും ജലാംശ ശതമാനവും തൊലിയി

ലെയും വിത്തിലെയും അസംസ്കൃത പ്രോട്ടീൻ ശതമാനവും മൂപ്പ് കൂടുന്നതനുസരിച്ച് കറഞ്ഞു വരുന്നതായിട്ടാണു കണ്ടത്. ഈ പഠനങ്ങളിൽ നിന്നും മലക്കുറിയവശ്യത്തിനുള്ള പച്ച വിത്തു കൾ പുത്തു കഴിഞ്ഞു 34 ദിവസത്തിനുശേഷം വിളവെടുക്കുന്നതാണുത്തമമെന്നു തെളിഞ്ഞു.

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