

Changes in Oil, Tannin, Total Sugar Contents and Yield after Flowering in Peanut

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ABSTRACT

This study was carried out to determine the optimum harvest date of unshelled immature peanuts and dried kernels from 60 to 120 days after flowering. Fresh pod yield of spanish-type variety, "Shaedltangkong(SD)" reached a peak of 9,140kg/ha at 70 days after flowering(Aug. 13) while that of virginia-type variety, "Daepoongtangkong(DP)" reached a peak of 8,820kg/ha at 90 days(Sept. 11) after flowering.

SD and DP showed maximum fresh kernel yield of 6,090 and 6,470kg/ha at 90 days after flowering (Sept. 11), respectively, while dry kernel yield reached a peak of 3,300 and 3,720kg/ha at 110 days(Oct. 1), respectively.

Oil content of SD and DP were the highest at 90 days and 100 days after flowering, respectively and the oil content of two varieties increased rapidly from 60 to 90 days.

Tannin content of the seed hull of SD increased continuously until 110 days after flowering while that of DP maximized at 100 days. The tannin content of the two varieties increased rapidly from 60 to 100 days.

Total sugar of SD and DP showed highest content at 60 days and 70 days after flowering, respectively and sugar content decreased very rapidly until 80 days and after that sugar content kept nearly constant.

Oil, tannin and total sugar content of spanish-type SD were higher than those of virginia-type DP.

Keywords : peanut, pod yield, kernel yield, oil content, tannin content, total sugar content.

Peanuts were consumed mostly as roasted kernels but recently consumption of unshelled immature or boiled peanuts increased, in part due to the use of peanuts as a snack and a relish taken with beer in Korea.

Sugar and tannin contents as well as fresh pod yield are important factor for determination of the harvest date when peanuts are used for the unshelled immature peanuts.

The pod took about 60 days from fertilization to full maturity (Patal et al., 1936 ; Seshadri, 1962) and

the pod attained its maximum size within 3 weeks after the penetration of the peg into the soil(Patal et al., 1936).

The peg emerged 5~7 days after fertilization and reached the surface of the soil 10~17 days after fertilization. The outside shape of the pod developed completely 30~40 days after penetration of the peg into the soil and the kernel fully matured 50~60 days after that(Kim et al., 1997).

Small-seed and large-seed varieties each took 60 days and 80 days from fertilization to full maturity, respectively (Emery et al., 1981;Shear & Miller, 1955).

Harvest date was determined with the consideration of outside shell shape of the pod and the maturity degree of kernel when its leaves had fallen by 10~20%.

Generally, kernel yield was maximized at 100~120 days after flowering in Korea, but the optimum harvest date was different between varieties and plant types (Park & Oh, 1992).

Oil and protein content of the kernel increased more rapidly in spanish-type varieties than in virginia-type varieties(Patal & Seshadri, 1935 ; Pickett, 1950).

Oil content was different among varieties, plant types, maturation period and seed size. Oil content of spanish-type cultivars with medium-maturity and small-seed was higher than those of virginia-type cultivars with early and late-maturity and large-seed (Park et al., 1991).

Peanut had indefinite florescence and the flowering period of spanish-type varieties was about 101~105 days while it was 85~95 days in virginia-type varieties (Lee et al., 1984).

The degree of maturity of the pods within a plant was not uniform due to its comparatively long period of flowering and ripening. Nowadays, harvest date of peanuts is decided by the usage such as the unshelled immature peanuts or the roasted one in local markets of Korea.

This study was carried out to determine the optimum harvest date for maximizing fresh and dry yield and to investigate oil, tannin and sugar content of the unshelled immature peanuts according to dates after flowering.

MATERIALS AND METHODS

Spanish-type variety, "Shaedltangkong(SD)" and virginia-type variety, "Daepoongtangkong(DP)" were

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Table 1. Accumulative temperature after planting at Suwon, Korea.

Dates after flowering	60	70	80	90	100	110	120
Accumulative temperature(°C)	2,271	2,478	2,721	2,986	3,250	3,434	3,593
Dates from planting	98	107	112	127	137	147	156

planted at the experiment farm of Industrial Crop Division of National Crop Experiment Station, RDA, Suwon, the Republic of Korea in 1998.

Black polyethylene film of 0.015 mm was used for mulching and seeds were sown on May 3. Width of row and furrow was 40 and 60cm, respectively, with 25cm of plant spacing. Fertilizer was basally applied with the rates of 30-140-100-1,500 kg/ha for N - P₂O₅ - K₂O - Ca, respectively, before planting. Experimental plots were laid out in a randomized complete block design with 3 replications and each plot size was 6m² with four rows. Other cultural practices were conducted with standard cultural methods of RDA. Yield and chemical composition of kernels were investigated at the interval of ten days from 60 to 120 days after flowering starting at Aug. 13(60 days). Harvested pods and kernels were weighed to determine fresh weight and dried at 60°C for 48 hours for dry weight and chemical composition analysis. Oil content from the kernel was measured by the soxhlet using hexane for 5 hours. Tannin and total sugar content were determined by the Folin-densi method(A.O.A.C., 1980) and 5% - Phenyl sulfuric acid method(Jo, 1992), respectively. Accumulative temperature after planting at experimental sites are shown in table 1.

RESULTS AND DISCUSSION

Fresh pod yield of spanish-type variety(SD) reached maximum of 9,140kg/ha at 70 days after flowering (Aug. 22) while that of virginia-type variety(DP) reached a peak of 8,820kg/ha at 90 days(Sept. 11) as shown in Fig. 1.

Fresh pod yield did not show significant differences

between 60~90 days after flowering in SD and between 70 and 80 days in DP.

Varietal difference of fresh pod yield from 80 to 100 days after flowering was relatively small compared to early and late maturation period, 60~70 days and 110~120 days. This might be due to the difference of maturity and foliar disease resistance.

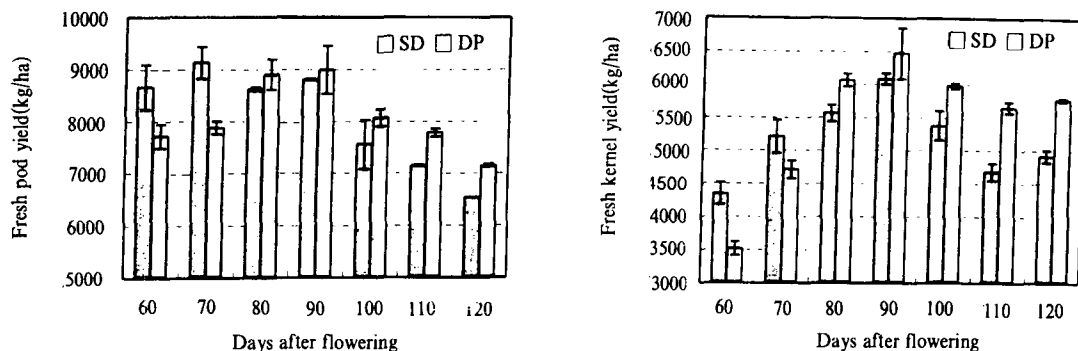
Fresh kernel yield of SD and DP reached a peak of 6,090 and 6,470 kg/ha, respectively, at 90 days after flowering as shown in Fig. 1. Fresh kernel yield of DP showed no significant difference at 80 and 90 days after flowering.

Fresh pod and kernel yield of the two varieties increased quickly from 60 to 90 days after flowering. Fresh pod yield of the two varieties decreased slightly from 100 to 120 days but kernel yield increased again at 120 days.

Fresh pod yield of spanish-type SD from 60 to 70 days after flowering was higher than that of virginia-type DP but this was reversed from 80 to 120 days. Yield of SD at early stages was higher than that of DP because spanish-type varieties matured faster than virginia-type ones(Pickett, 1950).

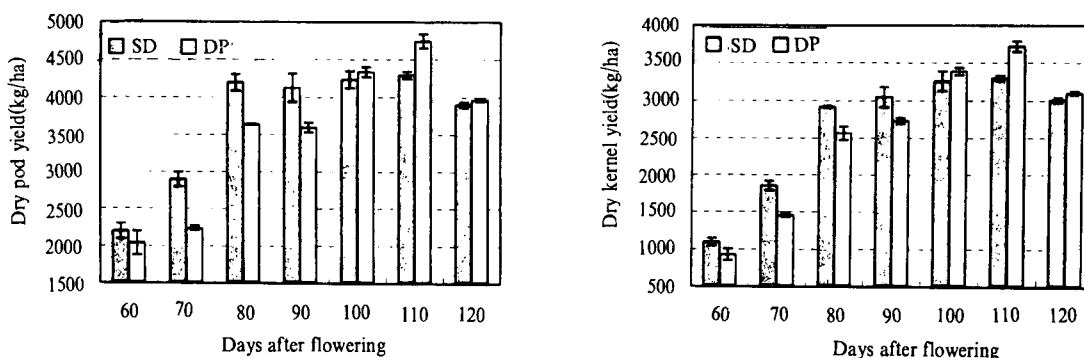
Dry pod yield of SD and DP reached a peak of 4,360 and 4,750kg/ha, respectively, at 110 days after flowering. At the same date dry kernel yield also showed maximum of 3,300 and 3,720kg/ha for SD and DP, respectively, as shown in Fig. 2.

SD showed no significant difference among 80~110 days in dry pod yield and also between 100 and 110 days in dry kernel yield. Dry pod and kernel yield of the two varieties generally increased very fast from 70 to 80 days after flowering and decreased suddenly at 120 days after flowering.



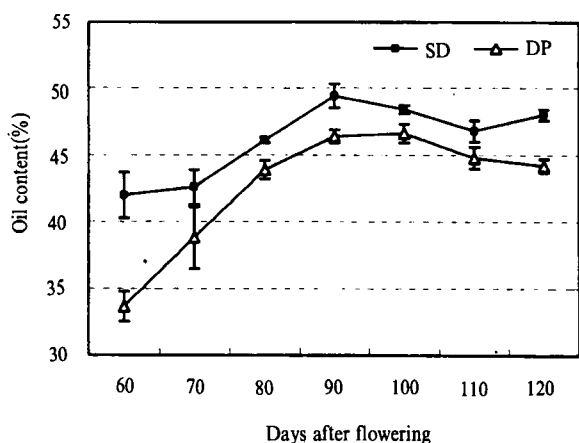
* SD : Saeditangkong(spanish-type), DP : Daepoongtangkong (virginia-type)

Fig. 1. Changes of fresh pod and kernel yield from 60 to 120 days after flowering in different peanut varieties.



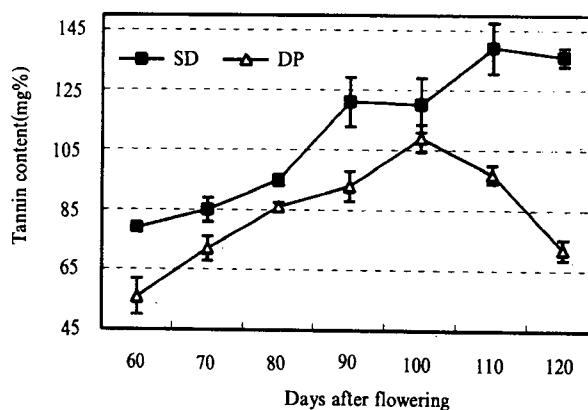
* SD : Saedltangkong(spanish-type), DP : Daepoongtangkong (virginia-type)

Fig. 2. Changes of dry pod and kernel yield from 60 to 120 days after flowering in different peanut varieties.



* SD : Saedltangkong(spanish-type), DP : Daepoongtangkong (virginia-type)

Fig. 3. Changes of oil content of kernel from 60 to 120 days after flowering in different peanut varieties.



* SD : Saedltangkong(spanish-type), DP : Daepoongtangkong (virginia-type)

Fig. 4. Changes of tannin content in dried seed hull from 60 to 120 days after flowering in different peanut varieties.

Park & Oh(1992) reported that the maturity period of spanish-type was shorter than that of virginia-type and the optimum harvest time of spanish-type was at 100~120 days after flowering while that of virginia-type was at 110~120 days.

In general, the longer the growing period of peanut was extended before frost, the higher the peanut yield if the peanuts had suitable climate conditions for growth. It was assumed that the yield decrease at 120 days after flowering might be the results of shattering and decay of pod and kernel by over-maturation, wet injury and foliar diseases, mainly web blotch because of the irregular high rainfall of 1998.

Oil content of SD reached a maximum of 49.4% at 90 days after flowering while that of DP reached maximum of 46.6% at 100 days as shown in Fig. 3. Oil content showed no significant difference between 90~120 days after flowering in SD and between 90~110 days in DP. Oil content of spanish-type SD was

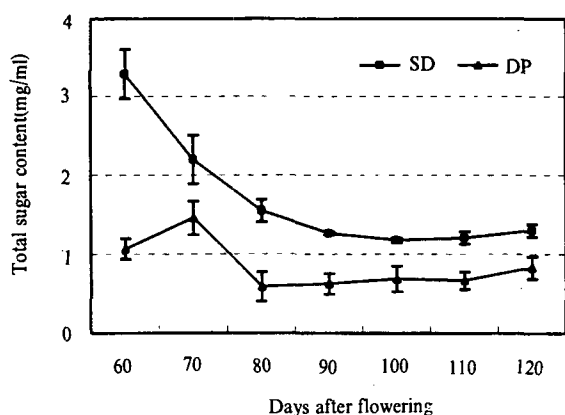
higher than that of virginia-type DP.

Patal & Sehadri(1935) also reported similar results that oil content of spanish-type varieties increased faster than that of virginia-type varieties.

Oil content of SD increased rapidly from 70 to 90 days and decreased steadily from 90 to 110 days and increased again at 120 days while that of DP increased rapidly from 60 to 80 days and decreased steadily from 100 to 120 days.

Tannin content of the dried seed hull in virginia-type variety of DP reached a peak of 109mg% at 100 days after flowering while its content in spanish-type variety of SD reached a peak of 139mg% at 110 days as shown in Fig. 4.

Tannin content of SD increased steadily until 110 days after flowering while tannin content of DP decreased after 100 days. Tannin content of SD was higher than that of DP. Although phenolics compounds like tannin extracted from the seed hull of peanut by methanol has strong antioxidation activity(Yen &



* SD : Saedltangkong (spanish-type), DP : Daepoongtangkong (virginia-type)

Fig. 5. Changes of total sugar content in dried kernel from 60 to 120 days after flowering in different peanut varieties.

Duh, 1994), varieties with lower tannin content shall be preferred because of the astringent taste of the unshelled immature or boiled peanuts.

Total sugar content of SD reached a peak of 3.39 mg/ml at 60 days after flowering while that of DP reached a peak of 1.37 mg/ml at 70 days as shown in Fig. 5. Sugar content showed no significant difference between 80~120 days within variety. Total sugar content of the two varieties decreased very quickly until 80 days after flowering but kept nearly constant after 80 days. Total sugar content of SD was higher than that of DP. Harvest at 60~70 days after flowering seemed

to be reasonable in terms of the consumer's taste of the unshelled immature or boiled peanuts because of its low tannin and high sugar content in spite of its lower yield.

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