This investigation was undertaken with a view to study the seasonal changes in growth and development of three varieties of soybean namely PB₁, Bragg and J.53NE and also to study the effect of GA₃ and some phenolic compounds on growth and flowering of this plant. Ontogenic and biochemical changes during inductive as well as non-inductive conditions were also studied.

Nine experiments were carried out in all. Experiment 1 was conducted to study the effect of photoperiod and time of sowing on growth and development of three varieties of soybean, while experiment 2 was designed to determine the minimum number of inductive cycles required for floral induction in these varieties, experiments 3-7 were conducted to study the effect of GA₃ (Experiment 3) and phenolic compounds SA, βN (Experiments 4-6), Cat and Caf (Experiment 7) on their growth and development. Experiments 8-9 deal with the ontogenic and biochemical changes in the contents of proteins peroxidases, (qualitative changes as well), RNA and DNA under both inductive and non-inductive conditions.

The results obtained are as follows:

Experiment 1

1. All the three varieties of soybean behaved as qualitative short day plants in April, October and January sowings,
but as quantitative short day plants in July sowing;
as floral buds were produced even under LD conditions
in this sowing, although the period to floral bud
initiation was much prolonged under this photoperiod,
so that floral buds appeared in the months of
November - January in different varieties.

2. In October and January sowings, floral buds did not
open into flowers in any variety. They developed
into pods directly.

3. In plants of April sowing fruit formation did not
occur under ND conditions, although the flowers
produced were fertile. However, floral buds in
this sowing were formed under SD conditions and in
other sowings both under SD and ND conditions.

4. Floral buds in plants of all the sowings, emerged
earliest in variety Pi., then in Bragg and last of
all in J53. NE under both SD and ND conditions. However,
under LD conditions, floral buds emerged earliest in
the variety Bragg and last of all in PB₁ in July
sowing.

5. More floral buds, flowers and pods were produced
on plants of July than on those of other sowings in
all the varieties. The number of flowers/inflorescence
was also higher in this than in plants of other
sowings.

6. The number of floral buds and flowers was much higher
under ND than under SD conditions in plants of July.
sowing, the differences being more marked in the varieties PB₁ and J53.NE than in the variety Bragg.

7. In all the varieties, floral buds emerged earlier under SD than under ND conditions in April and January sowings, but in PB₁ and Bragg in July and in J53.NE in October sowing.

8. In October and January sowings, fruits on the plants of the variety Bragg did not develop into pods with seeds. These, however, elongated as soon as the temperature rose.

9. While under SD and ND conditions, plants stopped linear growth after bearing flowers and fruits, under LD conditions, they continued to elongate and as a consequence of which plants ultimately grew taller under LD than under SD and ND conditions. In October sowing, when plants were subjected to decreasing temperatures, photoperiod did not affect linear growth significantly.

10. Plants of the variety PB₁ stopped increasing in length even under LD conditions in April sowing so that the height of plants of this variety did not differ under the three photoperiods.

11. Plants of all varieties grew taller and also produced more leaves during April and July than in October and January sowings, being the tallest in July sowing.

12. Plants of the variety PB₁ were the shortest and those
of Bragg and J53.NE the tallest in all sowings.

13 In all varieties, leaflets produced on plants under SD conditions were shorter than those under ND and LD conditions in all sowings, those of variety PB₁ being shorter than those of the other two varieties.

14 Branches in general were longer in April and July than in October and January sowings. Upper few nodes did not bear branches at all in all cases. These were only few cm long and arose in acropetal manner. Branches in the variety Bragg were few and were in fact absent in plants of October sowing under LD conditions.

15 Petioles were also shorter under SD than under ND and LD conditions. Initially the growth was fast during their emergence, then leveled off. Petioles on plants of July were the longest of all sowings and of variety PB₁ the shortest of the three varieties.

16 Plants under SD and ND conditions were weak and ultimately died after bearing flowers and fruits while those under LD conditions were healthy and green.

Experiment 2

17 A minimum of 3, 6 and 9 SD cycles were required for floral buds to appear in varieties Bragg, J53.NE and PB₁ respectively. The period to floral bud initiation
decreased with the increasing number of SD cycles. Height and number of leaves decreased with the increasing number of SD cycles, so that plants receiving continual SD cycles, were the shortest.

Experiment 3

19 All the plants of all the varieties both under SD and LD conditions became climbers with GA3 application, climbing in an anti-spiral fashion.

20 GA3 enhanced stem elongation, the enhancement being more with 100 than 1 mg/l and under SD than under LD conditions in all cases.

21 GA3 did not induce floral buds under LD conditions although it hastened it slightly under SD conditions the effect being more with 1 mg/l GA3 in varieties PB1 and Bragg. GA3 also increased the number of floral buds.

Experiment 4

22 100 mg/l GA3 alone as well as in combination with 100 mg/l SA and BN enhanced stem elongation.

23 BN alone as well as in combination with GA3 enhanced stem elongation under LD conditions, while SA depressed stem elongation under SD conditions.

24 Both 100 mg/l SA and BN delayed floral bud initiation and flower opening alone as well as in combination
with GA_3. The higher concentrations of these phenols also decreased the number of floral buds and flowers.

Experiment 5

25 1 mg/l of both SA and BN enhanced linear growth markedly under SD, ND as well as LD conditions, the effect being more under LD conditions and BN being more effective than SA.

26 Both 1 mg/l SA and 1 mg/l BN increased the number of floral buds as well as flowers under SD and ND conditions, the increase being more with BN under SD but with SA under ND conditions. The period of floral bud initiation and flowering was also slightly hastened with 1 mg/l SA under ND conditions. Under SD conditions these did not affect the time taken to produce floral buds and flowers.

Experiment 6

27 While 1 mg/l BN alone and in combination with 1 mg/l GA_3 slightly hastened floral bud initiation and flowering, in combination with 100 mg/l GA_3, they did not affect the period of flowering significantly.

28 1 mg/l BN alone or in combination with 1 and 100 mg/l GA_3 increased the number of floral buds as well as flowers, the number of floral buds in plants treated with the combination 1 mg/l BN + 100 mg/l GA_3 being
more than even with 100 mg/l GA$_3$ alone. However, 1 mg/l SA in combination with 100 mg/l GA$_3$ decreased the number of floral buds.

**Experiment 7**

29 1 as well as 100 mg/l of both Cat and Caf increased stem growth under SD conditions, 1 mg/l of Cat and Caf enhanced linear growth under LD conditions.

30 Both Cat and Caf increased the number of floral buds and flowers, 100 mg/l Caf being more effective in this respect.

**Experiment 8**

31 First differentiable floral bud at the microscopic level was observed in plants that had received 3 SD cycles, although, it became clear macroscopically after 18-19 days.

32 The organization of the apical meristem under non-inductive conditions conformed to the tunica-corpus concept. It was dome-shaped. The structure of the vegetative axillary buds was also identical to the shoot apex.

33 The apex was converted into floral primordia under inductive conditions and terminal floral buds could be observed in plants that had received 10 SD cycles.
Mature ovary and anthers could be seen in plants receiving 19 SD cycles. The ovary and the surface of plant was covered with abundant hairs or trichomes.

Experiment 9

RNA as well as DNA contents of the leaf and the stem were more in plants receiving 2–3 SD cycles and decreased with higher number of SD cycles as compared with the respective number of LD cycles. Protein content was more in plants receiving SD than LD cycles, being higher in those that received 3 SD cycles. It was more in the leaves than in the stem. Peroxidase activity was more in the stem than in the leaf both under inductive and non-inductive conditions. Peroxidase activity was also more under SD than under LD conditions and decreased markedly with the increasing number of SD or LD cycles.

A new protein band with Rf 0.56 developed in the leaf only in plants receiving 2 or 3 SD cycles. It was lacking in the leaves of plants under non-inductive conditions. No new protein band was present in the stem under inductive photoperiod.

The number of peroxidase bands in the leaf and the stem did not differ. A new isoenzyme band with low Rf 0.25 was present in the leaf of plants.
receiving 2 SD cycles. Two new bands with Rfs 0.08 and 0.50 appeared in the stem of plants that received 4, 18 and 2, 3 SD cycles.

The results have been discussed in the light of available literature.