DISCUSSION

The study conclusively proves that both the trees Cassia siamea and Pongamia pinnata play definite allelopathic roles in agricultural and wasteland ecosystems. The effect of C.siamea is less pronounced while P.pinnata exhibited strong inhibitory effect on the test species in most of the treatments.

Cassia siamea

Various extracts of C. siamea was in general found inhibitory to germination and dry weight of wheat. Germination was adversely influenced by leaf, stem wood, root wood and seed extracts. Dry weight was inhibited by extracts of leaf, stem wood and root wood. Leaf and seed extracts promoted the shoot length; otherwise various other extracts did not exert any significant effect on shoot length. Similar were the results obtained for root length where except for stem wood and pod extracts all the lower concentrations had promoted the root length.

Contrary to that of wheat, C. siamea did not exert a negative influence on rice except for the seed germination. The inhibition to germination was more pronounced in leaf, root wood, stem wood and seed extracts. In all other treatments rice was favoured by C. siamea.

The leaves and seeds of C.siamea exerted a very negative influence on the performance of C. occidentalis. In some cases the stem bark or root bark did not have any effect or effected slight promotion in growth. Since the contributions of stem and root barks on the allelopathic properties of these trees would be insignificant the total effect would be on the negative side.

The response of C. tora to the extracts of C.siamea was mixed, wherein the lower concentrations promoted the growth and the higher concentrations were inhibitory. Other concentrations of the extracts did not exert any effect. But in general, the total response of the test species was again on the negative side.

Pongamia pinnata

Various extracts of P. pinnata in general, exhibited an adverse effect on wheat except for the dry weight of the seedlings. All the parts of the tree inhibited germination of seeds while most of the extracts inhibited shoot length. Same case was observed with root. Concentration effect is quite vivid for some of the extracts wherein lower concentrations promoted the growth and higher concentrations were proved deleterious. Leaf and seed extracts need a special mention for their phytotoxic potential. The dry weight was found promoted throughout.

Extracts of P. pinnata did not exert any effect on germination of rice. A positive response of growth of rice was observed with a simultaneous increase in concentration. Except for higher concentrations of a few extracts which adversely effected the germination of seeds, root length and dry weight of seedlings was favoured by P.pinnata.

P.pinnata exhibited a negative interference on the germination and growth dynamics of C.occidentalis. Except for some cases where pod extract exerted slight promotion of germination and stem bark or stem wood effected insignificant promotion in root growth, almost all the treatments affected the germination of seeds and growth of the seedlings including dry weights adversely. Since the contributions of stem bark and stem wood on the allelopathic property would be non significant the total effect would be on the negative side. Here leaf is closely followed by seeds and roots in their toxic potency exhibiting maximum deleterious effect.

The various extracts of P.pinnata exhibited complete extinction of C.tora, wherein all its parts were totally inhibitory for germination of seeds of C.tora irrespective of treatments and concentrations. One or two seedlings which germinated did not survive the test period, proving its excellent herbicidal property.

The results clearly indicate that both C.siamea and P.pinnata are no exceptions to the other agro/social forestry trees recommended. Both the trees are found to cause more harm than benefit to the plants in the vicinity. But between the crops, wheat and rice, the latter tolerated both the trees very well, and in comparison of both the trees, the test plants tolerated C.siamea more to P.pinnata. Both the trees were found to affect wheat adversely, the reciprocal correlation of growth with concentration which was seen in some cases supports the dose linked allelopathic phenomenon.

These results are in line with previous works of other workers wherein other social forestry trees were evaluated for their allelopathic potential on certain selected crop species. Leaves of C.siamea were found exhibiting allelopathic potential (reduced germination) on maize seeds (Hauser, 1993). Eucalyptus tereticornis leaf extract inhibited germination of wheat (Rao and Reddy, 1984). Allelochemicals from E.tereticornis adversely effected germination and seedling growth of wheat (Bisla et al., 1992; Joshi and Prakash 1992; Nandal et al., 1992). Bansal (1988) reported stem and leaf extracts of E.globulus decreased germination and growth of wheat and rice. Alam and Azmi (1989) reported aqueous extracts of Prosopis glandulosa inhibited the germination and seedling growth of wheat. Similarly, Acacia nilotica leaves and bark extract inhibited seed germination, radicle and plumule growth of sorghum. Bark extract was more inhibitory than leaf extracts (Swaminathan et al., 1989).

Among the weeds also the situation is not very different. Pongamia was exceptionally harmful to both the weeds screened while C. siamea was slightly tolerant to C. tora. Surprisingly not enough data on the allelopathic effects of social forestry trees on weeds are available. However, it was reported that C.siamea inhibited the seed germination and radicle growth of herbaceous species of understorey vegetation (Goel and Sareen, 1986).

The excellent herbicide potential of both the trees are evident in the present work with regard to the two weeds studied. The effects of P. pinnata on C. tora deserves a special mention here in that all the seeds of the weed decayed after a few days in the presence of any of the extracts of the former plant. More detailed studies would bring out exciting data on the compounds responsible to this effect. The weedicide properties of these trees against other weeds are not yet known. This may prove to be an exciting field of research in the near future. The tolerance exhibited by rice to C. siamea and P.pinnata prove that these trees can be planted near paddy fields in which case it may prove allelopathic to some weeds and since only germination is inhibited the leaves of these trees can be used as a green manure also.

Both the trees are rich sources of allelochemics. The compounds exerting allelopathic influence may be any of the compounds reported earlier or in the present work. C.siamea contained flavones, isoflavones, flavonols, quinones, dianthrones, phenolic acids besides saponins, polysaccharides and sugars whereas P.glabra possessed phytochemicals like flavonoids, anthocyanins and phenolic acids. Many of these compounds especially flavonoids, quinones and phenolic acids are known to be allelopathic in nature. Infact, the same phenolic acid present in both the trees i.e., vanillic, syringic, p-OH benzoic, protocatechuic, melilotic, gentisic, sinapic, p-coumaric and ferulic acids are found to be toxic to a number of crops like Trifolium pratense, T.repens, Phleum pratense and Lolium perenne (Casal et al., 1985), Isachne nipponensis and Centella asiatica (Chou et al., 1992), groundnut (Eyini et al., 1989), lettuce, rye grass and rice plants (Chou and Hou, 1981). This supports the contention that phenolic substances are recognised allelopathic more often than any other class of chemicals, of which phenolic acids appear to be the most potent allelochemics (Moje, 1966).