genetic transformation have been successful and an analytical treatment of those publications was perhaps required, so that the scientists entering the field may get a proper direction. The enzymes involved in the scavenging of reactive oxygen species, and the small molecular weight antioxidants play an important role in tolerance/protection against abiotic stresses. A better treatment of genetic variants, mutants and transgenics with altered levels of these enzymes and antioxidants, and consequently with changed level of tolerance/susceptibility was also required. Perhaps the most important omission was the lack of any mention of transgenics with altered air pollution tolerance. Although the authors have mentioned ozone as one of the abiotic stresses, they have not described any transgenic crop plant. Transgenic tobacco plants with altered response to ozone and H_2S are known. Several barley mutants with increased tolerance to NO_2 are also known and attempts have been made to understand the basis of tolerance by using these mutants. In fact, I was associated with the scientists at Lancaster University, Lancaster in one such study, where we found that the root system was contributing in some way towards the formation/activation of phytotoxic metabolite (Srivastava *et al.*, *J. Plant Physiol.*, 1994, **143**, 738). Nevertheless, the article forms very good general reading.

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Nitrogenous fertilizers, neem and vectors of Japanese encephalitis virus

Rajendra Prasad[1] has very effectively brought out the environmental problems caused due to excessive use of urea-based nitrogenous fertilizers. We would like to add another dimension to this problem, i.e. increase in mosquitogenic potential for Japanese encephalitis (JE) vectors in rice field eco-system. JE is a zoonotic, non-contagious, infectious disease caused by a *flavivirus*, transmitted by mosquitoes belonging to *Culex vishnui* sub-group, consisting of *Cx. tritaeniorhynchus*, *Cx. vishnui*, and *Cx. pseudovishnui* in southern India. The disease affects mainly children between the age group of 4 and 14 years. There have been many severe outbreaks of JE in India in the past and there is evidence to suggest that this disease is spreading to newer areas. The vectors of JE breed profusely in standing waters in rice fields and are therefore mainly associated with rice cultivation. There is evidence to suggest that changes in farming practices in rice cultivation have had far-reaching effects on the epidemiology of JE in southern India[2]. The demand for food in the south-east Asian countries to meet their increasing population has resulted in increase in the rice acreage. Intensive rice cultivation and introduction of high-yielding rice varieties in this region has increased the input of nitrogenous fertilizers in rice fields for more grain yield and this appears to have resulted in more breeding grounds for JE vectors.

When urea is broadcast into the rice fields, a part of ammonium-N is lost to the atmosphere due to ammonia volatilization and another part is oxidized to nitrite-N and later to nitrate-N. Ammonia is a oviposition attractant to mosquitoes. In a study in the South Arcot district, Tamil Nadu, increased oviposition (significantly more number of egg rafts) of *Cx. tritaeniorhynchus*, was observed in rice plots with urea application as compared to the untreated plots[3]. Nitrate-N is reported to enhance the growth of green algae which act as food for immatures of mosquitoes[4]. In a small field trial, a positive correlation between nitrate-N concentration and the abundance of culicines was observed[3]. Therefore, repeated applications of urea in rice fields appear to enhance mosquito breeding by these mechanisms.

Urea is degraded fast by nitrifying bacteria in rice fields. In order to retard degradation and thus decrease release of ammonia to the atmosphere, several methods have been suggested[1]. Coating urea with neem is one of them. Neem-coated urea is expected to release less ammonia to the atmosphere. The minimum concentration of atmospheric ammonia that enhances oviposition of JE virus vectors is not determined. Therefore, fields with neem-coated urea still have atmospheric ammonia albeit at a lower concentration which may attract increased oviposition. Further, algal growth is enhanced by neem which may be due to the release of nitrogen by neem products into the water in the rice fields. Therefore, theoretically neem-coated urea should enhance mosquito production in rice fields. However, neem possesses mosquitocidal principles such as azadirachtin, nimbin, nimbidin and other related bitter principles. In a field trial in Madurai, it was observed that when neem-coated urea was applied, there was 90% reduction in the breeding of JE vectors and increased grain yield[5].

We do not know the effect of other approaches mentioned by Rajendra Prasad[1] for slow release of nitrogen from urea, on the JE vectors. Therefore, we feel that wherever neem is available easily, it is desirable to use neem-coated urea in rice fields to control the breeding of JE vectors. In our experience, neem-coated urea has found favour with the farmers, because it not only increases the paddy yield but also reduces the pest load in rice fields. This approach is also eco-friendly and protects the environment from chemical insecticides.

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